

Health Care Workers' Views of Health Care's Contribution to Greenhouse Gas Emissions and Reducing Health Care Emissions

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ABSTRACT

Introduction: Climate change is the greatest global public health threat of this century, increasing respiratory, cardiovascular, and vector-borne diseases; mental health effects; and premature deaths. The US health care sector is responsible for 8% to 10% of the nation's greenhouse gas emissions; therefore, engaging health care systems in emissions reduction could improve health for all communities.

Methods: A 10-question survey was emailed to a convenience sample consisting of 211 faculty physicians, nurse practitioners, and physician assistants and an unknown number of other staff employed at 21 UW Health family medicine clinics. The survey measured knowledge of health care greenhouse gas emissions and included 2 open-ended questions to solicit opinions on sustainability priorities and barriers to waste reduction. Each clinic also received a 15-minute presentation on health care climate impact during one of their regularly scheduled meetings.

Results: Of the 130 survey respondents, 34% knew the health care sector is responsible for 8% to 10% of the US carbon emissions and 9% of non-greenhouse air pollutants. Only 26% knew that most of these emissions come from purchasing and transportation. However, 92% thought environmental sustainability should be incorporated into all clinical operations, and 74% wanted to know how to affect purchasing to reduce emissions. Top priorities were identified as investing in renewable energy, increasing recycling, and reducing waste (eg, single-use instruments). Top barriers to waste reduction were thought to be cost, complacency, and time.

Conclusions: Despite lack of knowledge of the health care sector's contribution to US greenhouse gas emissions, most surveyed health care workers wanted their health care system to incorporate environmental sustainability into all clinic operations. Additional research identifying knowledge gaps and soliciting opinions of other medical specialties and health care systems on health care greenhouse gas emissions may increase awareness of health care emissions, inform health care leaders, and lead to emissions reduction.

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INTRODUCTION

Climate change is depicted by the *Lancet* Countdown on Health and Climate Change as the greatest global health threat of the 21st century, with recent alarming increases in the rate of global warming directly threatening public health.¹ Similar to other public health issues, health impacts from climate change affect all of us but disproportionately threaten vulnerable communities due to exposure to poor air quality and extreme temperature, more work-related weather exposure, and flooding threats.² Extreme heat kills more Wisconsinites than any other weather disasters and is expected to become more frequent and last longer in the future.³ Likewise, flooding is anticipated to become more frequent and intense, increasing drinking water contamination, waterborne illnesses, and mold growth, affecting those with asthma and allergies.

Despite health care's mission to do no harm, the US health care sector is responsible for 8% to 10% of the nation's greenhouse gas emissions and 9% of harmful non-greenhouse air pollutants.⁴ Health care emissions are understandably a large

part of US greenhouse gas emissions. In fact, hospitals are the second most energy-intensive commercial buildings in the country since they are large buildings open 24 hours, 7 days a week while running energy-intensive heating, cooling, and ventilation systems.⁵ Additionally, medical waste, unsustainable materials, production of pharmaceuticals, and anesthesia gas—specifically sevoflurane and desflurane—are large contributors to health care

emissions.⁶ Therefore, while providing up-to-date care, health care systems are major contributors to the health impacts of climate change.

Studies show that health care workers care about how climate change is affecting their patients' health.⁷ One survey showed motivated health care professionals engage in health care sustainability, driven by concerns about these health implications and excessive health care waste, while recognizing their influence as health care professionals.⁸ However, upon review of sustainability survey literature, most surveys target surgery personnel about environmentally sustainable operating room practices and waste reduction.⁹⁻¹² Another survey estimated the ecological footprint¹³ of physicians and medical students and how they can reduce that footprint. A survey of family medicine physicians and their patients¹⁴ focused on climate change and dysphoria, but there were no family medicine surveys specific to health care greenhouse gas emissions or health care emissions reduction. This survey fills that gap by focusing on health care greenhouse gas emissions while engaging clinicians and other staff on specific ways to reduce these emissions.

METHODS

A survey of health care workers sought to measure knowledge of health care greenhouse gas emissions and query survey recipients about specific actions to decrease emissions and identify barriers to waste reduction. It was prepared as part of an educational initiative to engage health care workers—particularly physicians, nurse practitioners, and physician assistants—regarding health care environmental sustainability and to inform health care leaders of health care worker concerns and priorities. UW Health sustainability leaders were involved in developing the survey questions.

A 10-question online convenience survey (Box) was distributed using Qualtrics from February through June 2023 to 211 UW family medicine service line clinicians, which include faculty physicians, nurse practitioners, and physician assistants, and an unknown number of other staff. The survey inquired about their knowledge of health care greenhouse gas emissions and opinion on sustainability priorities at UW Health. There were 2 open-ended questions on sustainability priorities and barriers to waste reduction.

To increase uptake and engagement, the survey was distributed by the author to each of the 211 clinic faculty physicians, nurse practitioners, and physician assistants several days prior to a short presentation given to each clinic on health care greenhouse gas emissions and climate impact. The survey remained open, so a few respondents completed the survey after the presentation. Clinic office managers were asked to distribute the survey to nurses, medical assistants, patient service representatives, and other staff, but since this group of health care workers was not the primary group to engage, there was less focus on capturing this population of health care workers, nor is it known how many of them received the survey.

Box. Environmental Sustainability Survey Questions

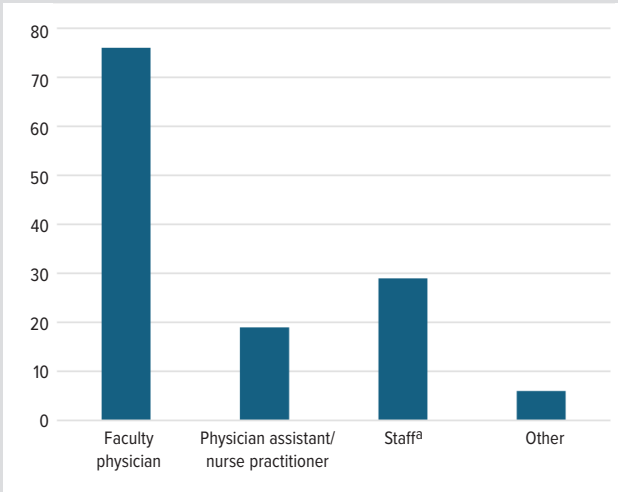
1. Tell us who you are:
 - Faculty physician
 - Physician assistant/nurse practitioner
 - Staff (includes nursing, patient services representative, other employees)
 - Other
2. What specific environmental sustainability issues should be addressed either in your clinic or within UW Health? (Consider specific waste issues, energy efficiency, chemical exposure, healthy food and give details) Please include what your clinic has worked on.
3. Of the following, choose 5 sustainability items that UW Health should prioritize:
 - ENERGY
 - Turn off electronics between use
 - Investing in renewable energy
 - UW Health vehicle emissions
 - WASTE
 - Printing patient instructions/after visit summaries/other purposes
 - Glove, mask, gown waste
 - Single use plastic/metal instrument waste
 - Food waste
 - Packaging waste
 - Recycling
 - TOXINS
 - Health risk of weed killers, insecticides
 - Health risk of cleaning chemicals for rooms and instruments
4. Please list other items that may not be listed in the previous question that you are concerned about in regard to sustainability.
5. Are you aware that it has been estimated that the US health care system is responsible for 8% to 10% of the nation's carbon emissions and 9% of harmful non-greenhouse air pollutants?
6. Are you aware that the majority of the health care greenhouse gas emissions come from purchasing, transportation, and other goods and services?
7. Are you interested in how you may affect purchasing to reduce greenhouse gas emissions?
8. Do you think UW Health should incorporate environmental sustainability into all clinical operations including infectious disease and safety?
9. Are you aware of the work on sustainability at UW Health including sustainability updates in the UW Health Weekly Wrap-Up email and/or the sustainability page on U-Connect?
10. What barriers do you see that may interfere with waste reduction at UW Health and how may UW Health overcome those barriers?

A separate, slightly different survey was distributed to all 47 family medicine residents by a family medicine resident. The survey differed by leaving off one of the open-ended questions, and a question was added asking if they wanted to become more involved in working on sustainability during their residency.

RESULTS

A total of 130 health care workers responded, though 5 individuals did not complete every question. For the target audience of 211 physicians, nurse practitioners, and physician assistants, 95 (45%) responded. There were an additional 35 respondents from other staff (Figure 1). Only 43 of 128 respondents (34%) knew that the health care sector is responsible for 8% to 10% of the US carbon emissions and 9% of harmful non-greenhouse air pollutants (Figure 2). Similarly, only 33 of 127 (26%) knew that the majority of greenhouse gas emissions come from purchasing,

Figure 1. Survey Participants, N=130



^aStaff includes nursing, patient service representative, other employees.

Figure 2. Responses to Survey Question 5, N=128

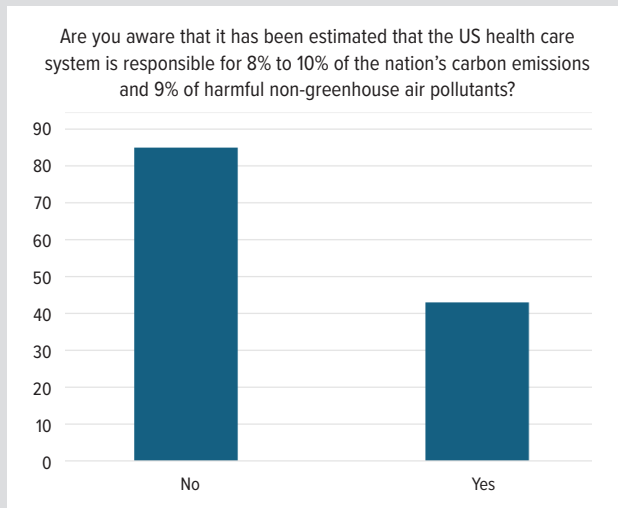
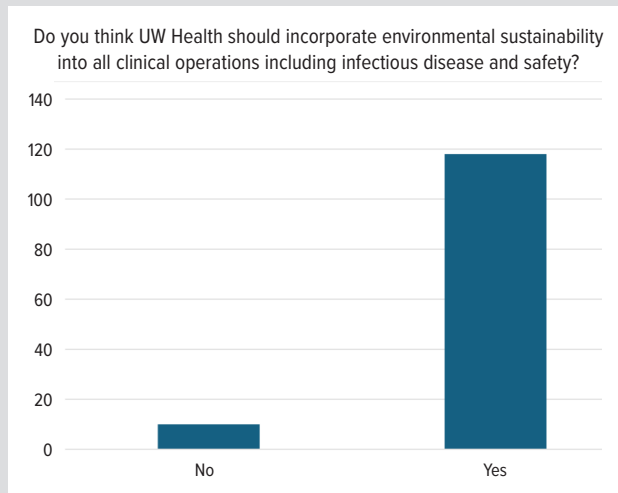


Figure 3. Responses to Survey Question 8, N=128



transportation, and other goods and services. One hundred eighteen of 128 respondents (92%) thought sustainability should be incorporated into all clinical operations, including infectious disease and safety (Figure 3). Ninety-five of 128 respondents (74%) wanted to know how they could affect purchasing to reduce emissions.

When asked to choose 5 top sustainability priorities (Figure 4), the highest-ranking choice was investing in renewable energy (n=88). Other high-ranking choices were glove/mask/gown waste (n=68), recycling (n=61), single use plastic/metal instruments (n=61), packaging waste (n=57), printing patient instructions/after visit summary/other printing (n=55), and health risk of cleaning chemicals for rooms and instruments (n=47).

An open-ended question asked recipients to list other items not listed as a priority. More specific comments about waste (n=24) emerged including “too much glove use,” “stop double bagging,” and “one-time use products.” Nineteen comments were made about recycling such as “proper sorting of waste/recycling,” “getting recycling back after COVID,” and “labeling recycling bins.” Specific comments (n=17) about energy efficiency mentioned “heat and AC [air conditioning] too high,” “lights, computers, radio left on,” and “switch to renewables.” Sixteen respondents commented about paper waste from faxes, forms, and paper on exam tables. Six commented on personal protective equipment (PPE), overuse of gowns and gloves, or switching to reusable gowns. Eight mentioned plastic speculums, including “replace with reusable lighted speculum.” There were 8 food-related comments, including “healthy food options onsite” and “compost at each clinic.” Driving/commuting was mentioned 4 times with suggestions for offering incentives to reduce individuals driving to work and reducing flying for business trips or CME events. Three mentioned adding electric vehicle charging stations to existing clinics. Two mentioned chemical use by a landscaping company.

Forty-two of 129 (33%) respondents were aware of UW Health’s sustainability work and where to find this information on UW Health’s website.

Barriers to waste reduction were identified on an open-ended question. Top barriers mentioned were cost (n=45), complacency (n=31), and time (n=28). Many other barriers were identified, including concern for compromising patient care or safety (n=19), education about sustainability measures (distribution of knowledge/culture to new staff) (n=15), leadership support (higher level not listening to physician concerns) (n=16), other priorities (n=15), culture/convenience (n=14), The Joint Commission “favoring of disposables” (12), demands of protection from infectious disease through PPE (n=9), resources (n=9), and lack of incentives (n=4).

Of the 47 family medicine residents, 22 (47%) responded to a separate survey. Fifty-nine percent knew that the health care sector is responsible for 8% to 10% of the US carbon emissions, and 31% knew that where the majority of the emissions came

from. Eighty-two percent were interested in how they could affect purchasing to reduce emissions, and 100% thought sustainability should be incorporated into all clinical operations. Similar to the other survey, cost (3) was thought to be a top barrier to waste reduction on an open-ended question. Other barriers identified by residents included demands of protection from infectious disease through PPE (2), convenience of disposables (1), and communication/education (1). Thirty-two percent were interested in becoming more involved in working on sustainability during their residency. None of the residents knew about UW Health's sustainability work and where to find it on the website.

DISCUSSION

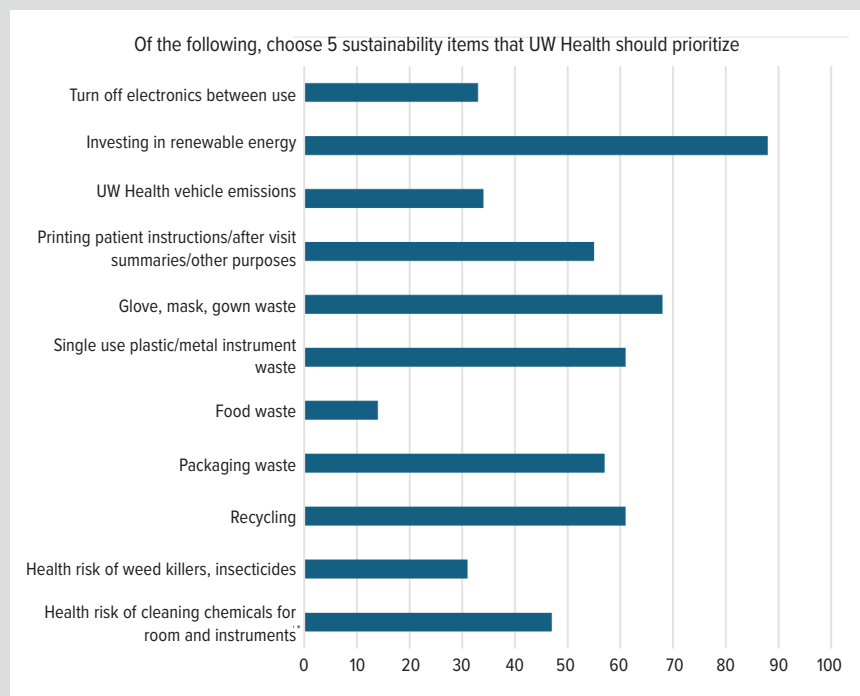
The survey showed that only a third of health care workers knew that the health care sector is a major contributor to US greenhouse gas emissions and air pollutants despite alarmingly high health care greenhouse gas emissions,⁴ defeating health care's mission to do no harm. Significantly more family medicine residents were aware, implying that younger physicians may be better educated on climate change and the health care sector impact.

Despite lack of knowledge of the health care sector greenhouse gas emissions, the vast majority of health care workers agreed that environmental sustainability should be incorporated into all clinical operations, including infectious disease and safety. More specifically, health care workers wanted their health care system to invest in renewable energy, decrease waste, and reduce the use of disposable instruments.

Barriers to waste reduction identified by the survey were many, but cost, complacency, and time were most frequently mentioned. A scoping review of barriers and enablers to implementing environmental sustainability practices identified similar barriers.¹⁵ This survey and the scoping review both identified a focus on leadership and a clear operational vision as keys to successful implementation. Survey respondents identified both leadership and The Joint Commission as barriers to waste reduction. Recognizing climate change as an important public health threat, The Joint Commission recently transformed its priorities, offering a voluntary sustainability certification,¹⁶ which all health care leaders could implement in their health care systems.

One intention of the survey was to inform health care leaders of the strong interest health care workers have to reduce health care greenhouse gas emissions in an effort to catalyze more widespread systemic change. A 2023 *Wisconsin Medical Journal* article¹⁷

Figure 4. Responses to Survey Question 3, N=125^a



^aSome respondents did not choose 5 sustainability items.

encouraged health care providers to use their trusted voices to have conversations about climate change to create public pressure to reduce greenhouse gas emissions. The survey sought to create a collective voice as an even more impactful influence on decision-makers. In this way, surveying other health care systems or medical specialties could illicit additional opinions about health care emissions reduction to collectively influence their health care leaders to execute ambitious environmental sustainability strategies.

Survey Limitations

The survey had several limitations. It was a convenience sampling of the UW Health Department of Family Medicine and Community Health and may not generalize to other medical specialties or health care systems. Knowledge and values around environmental stewardship and health care impacts likely vary in other medical groups. Those who chose not to complete the survey may be less informed about the intersection between climate health and health care's contribution to greenhouse gas emissions. The survey remained open, so a few respondents completed the survey after the clinic presentation. The presentation revealed how health care systems contribute to emissions, so this would favor respondents stating they knew how health care contributes to US carbon emissions. Despite this, results showed the majority of faculty physicians, nurse practitioners, physician assistants, and staff did not know these facts. Another limitation is that we did not use a validated survey instrument, since the survey originally was designed to gauge health care worker's knowledge and opinions

for internal use. Additionally, the project was focused on health care professionals, but since the presentations varied and at times were given to a mix of health care workers, the “other” category was used to capture health care workers who were not otherwise specified.

CONCLUSIONS

In this survey, most health care workers were not aware of the extent that health care contributes to US greenhouse gas emissions but had strong and specific opinions about prioritizing emissions reduction. The vast majority agreed that sustainability should be incorporated into all clinical operations. Surveying other medical specialties or health care systems could identify knowledge gaps and illicit unique opinions to inform health care leaders of their concerns.

Ironically, the health care sector contributes significantly to climate change, jeopardizing public health for all of us, but especially for the most vulnerable populations. Amplifying health care workers’ concerns collectively may inspire their leaders to develop a clearer vision for emissions reduction. It is imperative that UW Health and all health care systems increase education about health care greenhouse gas emissions and implement systemic actions at all levels to most effectively reduce emissions. More research is needed to identify strategies to engage health care leaders to overcome barriers and systemically reduce health care emissions to improve public health.

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REFERENCES

1. Romanello M, Napoli CD, Green C, et al. The 2023 report of the Lancet Countdown on health and climate change: the imperative for a health-centred response in a world facing irreversible harms. *Lancet*. 2023;402(10419):2346-2394. doi:10.1016/S0140-6736(23)01859-7
2. Climate Change and Social Vulnerability in the United States: A Focus on Six Impacts. U.S. Environmental Protection Agency; 2021. Accessed October 20, 2023. https://www.epa.gov/system/files/documents/2021-09/climate-vulnerability_september-2021_508.pdf
3. Patz JA, Lois AN, Clifford S, Brossard D, Maibach E. Medical Alert! Climate Change Is Harming Our Health in Wisconsin. University of Wisconsin-Madison; 2020. Accessed October 20, 2023. <https://ghi.wisc.edu/wp-content/uploads/sites/382/2020/10/Medical-Alert-Climate-Change-is-Harming-Our-Health-in-Wisconsin.pdf>
4. Eckelman MJ, Huang K, Lagasse R, Senay E, Dubrow R, Sherman JD. Health care pollution and public health damage in the United States: an update. *Health Aff (Millwood)*. 2020;39(12):2071-2079. doi:10.1377/hlthaff.2020.01247
5. Eckelman MJ, Sherman J. Environmental impacts of the U.S. health care system and effects on public health. *PLoS One*. 2016;11(6):e0157014. doi:10.1371/journal.pone.0157014

6. Mercer C. How health care contributes to climate change. *CMAJ*. 2019;191(14):E403-E404. doi:10.1503/cmaj.109-5722
7. Lewandowski AA, Sheffield PE, Ahdoot S, Maibach EW. Patients value climate change counseling provided by their pediatrician: The experience in one Wisconsin pediatric clinic. *J Clim Change Health*. 2021;4:100053. doi:10.1016/j.joclim.2021.100053
8. Sarfaty M, Kreslake JM, Casale TB, Maibach EW. Views of AAAAI members on climate change and health. *Allergy Clin Immunol Pract*. 2016;4(2):333-335.e26. doi:10.1016/j.jaip.2015.09.018
9. Lim BLS, Narayanan V, Nah SA. Knowledge, attitude, and practices of operating theatre staff towards environmentally sustainable practices in the operating theatres. *Pediatr Surg Int*. 2023;39(1):152. doi:10.1007/s00383-023-05400-6
10. Petre MA, Bahrey L, Levine M, Van Rensburg A, Crawford M, Matava C. A national survey on attitudes and barriers on recycling and environmental sustainability efforts among Canadian anesthesiologists: an opportunity for knowledge translation. *Can J Anaesth*. 2019;66(3):272-286. doi:10.1007/s12630-018-01273-9
11. Meyer MJ, Chafitz T, Wang K, et al. Surgeons’ perspectives on operating room waste: Multicenter survey. *Surgery*. 2022;171(5):1142-1147. doi:10.1016/j.surg.2021.12.032
12. Baxter NB, Yoon AP, Chung KC. Variability in the use of disposable surgical supplies: a surgeon survey and life cycle analysis. *J Hand Surg Am*. 2021;46(12):1071-1078. doi:10.1016/j.jhsa.2021.05.027
13. Jabbari-Zadeh F, Karbassi A, Khetan A. The ecological footprint of physicians: A survey of physicians in Canada, India, and USA. *PLoS One*. 2023;18(9):e0291501. doi:10.1371/journal.pone.0291501
14. Boland TM, Temte JL. Family medicine patient and physician attitudes toward climate change and health in Wisconsin. *Wilderness Environ Med*. 2019;30(4):386-393. doi:10.1016/j.wem.2019.08.005
15. Aboueid S, Beyene M, Nur T. Barriers and enablers to implementing environmentally sustainable practices in healthcare: A scoping review and proposed roadmap. *Health Manage Forum*. 2023;36(6):405-413. doi:10.1177/08404704231183601
16. The Joint Commission announces sustainable healthcare certification for U.S. hospitals. New release. The Joint Commission. September 18, 2023. Accessed December 5, 2023. <https://www.jointcommission.org/resources/news-and-multimedia/news/2023/09/sustainable-healthcare-certification-for-us-hospitals/>
17. Krawisz B. Join the conversation: talking about the health consequences of global heating/climate destabilization. *WMJ*. 2023;122(3):226-232.

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