# Green-ifying Clinical Trials

Rachel Shenker, MD;* Julie Bloom, MD; Katie Lichter, MD, MPH

In oncology, clinical trials are of utmost importance to advance treatment options and management of cancer care. However, there is growing awareness concerning the environmental impact of health care practices. This has led to urgent demands for action.[1-5] Research conducted in the United Kingdom has revealed that the carbon footprint of clinical trials is substantial, with the main contributors including travel required for these trials, the delivery of trial drugs, and the inefficiencies in enrolling participants.[6] Of the 350,000 clinical trials registered acro ss the globe, it is estimated that this equates to a carbon consumption of 27.5 million tons.[7] As part of the National Health Service, the Sustainable Healthcare Coalition has set up resources and a working tool to test on clinical trials to measure carbon emissions, and the National Institute for Health and Care Research has published a Carbon Reduction Guide. However, in the United States, such measures have not been implemented. Thus, we present the following suggestions for the reduction of environmental toxicity within US cancer clinical trials.

1. **Explore opportunities for decentralized clinical trials**: Recognizing that patients frequently face the challenge of traveling long distances to participate in trials,[8] we encourage the leveraging of community partnerships aimed at exploring the feasibility of decentralizing clinical trials. Recent studies have indicated that travel and driving distance for individual radiation therapy treatments are significant contributors to emissions related to cancer care.[9-11] By exploring this approach, we could potentially reduce travel-related emissions while also expanding access, thereby mitigating financial burdens and socioeconomic disparities in trial enrollment.[12]
2. **Enhanced transportation and housing assistance**: To address the issue of long travel distances, we advocate for increased access to public transportation, charity care, and affordable housing for patients requiring multiday treatments. This strategy may significantly lessen both the environmental impact and financial strain associated with travel for clinical trials.
3. **Streamlined appointment scheduling**: We suggest partnering with cancer care navigators to effectively streamline and consolidate appointments for patients during clinical trial enrollment. Such strategic coordination has the potential to minimize the need for frequent long-distance travel, thereby leading to a more efficient trial participation process and contributing to a reduction in emissions.
4. **Enhanced utilization of telehealth**: Given the increasing adoption of and documented advantages of telehealth, such as the 36% reduction in greenhouse gas emissions observed at Stanford Health Care since 2019,[13] integrating telemedicine into the clinical trial framework is advisable. Studies indicate that telehealth

**Dr. Shenker** is a PGY5 resident physician, Duke University Hospital.

**Dr. Bloom** is a PGY5 resident physician, The Mount Sinai Hospital.

**Dr. Lichter** is a PGY4 resident physician, UC Climate Health Fellow, University of California San Francisco.

**Disclosures:** The authors have no conflicts of interest to disclose. None of the authors received outside funding for the production of this original manuscript and no part of this article has been previously published elsewhere.
**Corresponding author:** *Rachel Shenker, MD, Department of Radiation Oncology, Duke University Hospital, 20 Duke Medicine Cir, Durham, NC, 27710. (rfs9@duke.edu)

Published: March 1, 2024. https://doi.org/10.1016/ARO-D-24-00002

in oncology not only lowers carbon emissions associated with cancer care but also mitigates financial toxicities for patients and increases access to those in rural settings.[14-16] Its application is especially beneficial in assessing patient eligibility and reducing unnecessary travel.

5. **Prospective environmental data collection**: We advocate for the proactive collection of environmental impact data from the onset of the start of clinical trials. This initiative should be conducted in collaboration with environmental science schools or departments and involve climate health experts. Precise tracking of emissions throughout each phase of a trial is crucial for making well-informed decisions.
6. **Integration of environmental considerations in regulatory frameworks**: We encourage consideration of modifying the clinical trial authorization and regulatory submission processes to include an assessment of the environmental impact of the trials. This environmental evaluation should be considered as critical as the evaluation of cost, equity, and access in the regulatory process.
7. **Interdisciplinary collaboration**: We call for a concerted effort among oncology teams, environmental specialists, and cooperative groups to devise holistic strategies. These strategies should aim to lower the costs for patients and health care institutions, broaden the accessibility of clinical trials, and reduce the overall carbon footprint associated with these trials.

By implementing these recommendations, we can address the environmental impact of clinical trials while improving accessibility and reducing financial burdens on patients.

## References


1) Chuter R, Lowe G, Dickinson N. Curing a malignant climate. *Clin Oncol (R Coll Radiol)*. 2022;34(3):148-150. doi:10.1016/j.clon.2021.12.018

2) Lichter KE, Anderson J, Sim AJ, et al. Transitioning to environmentally sustainable, climate-smart radiation oncology care. *Int J Radiat Oncol Biol Phys*. 2022;113(5):915-924. doi:10.1016/j.ijrobp.2022.04.039

3) Hantel A, Abel GA. An action plan for environmentally sustainable cancer care. *JAMA Oncol*. 2020;6(4):469-470. doi:10.1001/jamaoncol.2019.5364

4) Bernicker E, Averbuch SD, Edge S, et al. Climate change and cancer care: a policy statement from ASCO. *JCO Oncol Pract*. 2023:2300637. doi:10.1200/OP.23.00637

5) Climate Change Statement. American Society for Radiation Oncology. Accessed January 2, 2024. https://www.astro.org/Patient-Care-and-Research/Climate-Change-Statement#:~:text=Education%20and%20Engagement%3A%20ASTRO%20is,to%20reduce%20climate%2Drelated%20risks.

6) Sustainable Trials Study Group. Towards sustainable clinical trials. *BMJ*. 2007;334(7595):671-673. doi:10.1136/bmj.39140.623137.BE

7) Adshead F, Al-Shahi Salman R, Aumonier S, et al. A strategy to reduce the carbon footprint of clinical trials. *Lancet*. 2021;398(10297):281-282. doi:10.1016/S0140-6736(21)01384-2

8) Borno HT, Zhang L, Siegel A, Chang E, Ryan CJ. At what cost to clinical trial enrollment? A retrospective study of patient travel burden in cancer clinical trials. *Oncologist*. 2018;23(10):1242-1249. doi:10.1634/theoncologist.2017-0628

9) Frick MA, Baniel CC, Qu V, et al. Effect of radiation schedule on transportation-related carbon emissions: a case study in rectal cancer. *Adv Radiat Oncol*. 2023;8(5):101253. doi:10.1016/j.adro.2023.101253

10) Coombs NJ, Coombs JM, Vaidya UJ, et al. Environmental and social benefits of the targeted intraoperative radiotherapy for breast cancer: data from UK TARGIT-A trial centres and two UK NHS hospitals offering TARGIT IORT. *BMJ Open*. 2016;6(5):e010703. doi:10.1136/bmjopen-2015-010703

11) Cheung R, Ito E, Lopez M, et al. Evaluating the short-term environmental and clinical effects of a radiation oncology Department's response to the COVID-19 pandemic. *Int J Radiat Oncol Biol Phys*. 2023;115(1):39-47. doi:10.1016/j.ijrobp.2022.04.054

12) Nipp RD, Hong K, Paskett ED. Overcoming barriers to clinical trial enrollment. *Am Soc Clin Oncol Educ Book*. 2019;39:105-114. doi:10.1200/EDBK_243729

13) Thiel CL, Mehta N, Sejo CS, et al. Telemedicine and the environment: life cycle environmental emissions from in-person and virtual clinic visits. *NPJ Digit Med*. 2023;6(1):87. doi:10.1038/s41746-023-00818-7

14) Jiang CY, Strohbehn GW, Dedinsky RM, et al. Teleoncology for veterans: high patient satisfaction coupled with positive financial and environmental impacts. *JCO Oncol Pract*. 2021;17(9):e1362-e1374. doi:10.1200/OP.21.00317

15) Thota R, Gill DM, Brant JL, Yeatman TJ, Haslem DS. Telehealth is a sustainable population health strategy to lower costs and increase quality of health care in rural Utah. *JCO Oncol Pract*. 2020;16(7):e557-e562. doi:10.1200/JOP.19.00764

16) Holmner A, Ebi KL, Lazuardi L, Nilsson M. Carbon footprint of Telemedicine solutions--unexplored opportunity for reducing carbon emissions in the health sector. *PLoS One*. 2014;9(9):e105040. doi:10.1371/journal.pone.0105040