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Climate change and the prescription pad

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Climate change and the prescription pad

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Physicians are increasingly concerned about the climate crisis. In September, 2019, health-care professionals participating in Extinction Rebellion action blocked the entrance to the UK's Department for Business, Energy and Industrial Strategy to protest about impotent responses to climate change. Health Care Without Harm has formed a Global Green and Healthy Hospitals Network, "which has over 1650 members in more than 75 countries and every world region, who are using innovation, ingenuity, and investment to transform the health sector and foster a healthy, sustainable future".¹ Notably, the RISE Southeast Asia Alliance for Health and Climate based in the Philippines has formed chapters in Malaysia, Indonesia, and Taiwan with special attention to the effects that climate change has on regional health, including typhoons.² As the climate crisis continued to deepen, in 2021 the editors of medical journals called on doctors to consider "changing clinical practice".³ A resounding call in 2022 from editors of journals in Africa confirmed both the ethical and medical urgency of the climate crisis for health care in low-income countries.⁴

Health care is part of the climate problem. In 2014 the global health-care industry emitted 2 gigatons of carbon dioxide (CO₂), or 4.4% of the world's total.⁵ Visible examples include operating rooms overflowing with trash generated by disposable sterile supplies and surgical equipment, parking areas filled with private transportation reliant on fossil fuels, and constant energy flow to digital monitors and other technologies. But

pharmaceuticals—many of which are produced from fossil fuels—are the second most carbon intensive part of health care, after medical instruments and equipment, according to national data in the USA and UK.⁶ Estimates of pharmaceutical carbon within health care vary depending on what is counted, and how, but can be as high as 18% in the USA.⁷

This should be a particular concern in the USA, which consumes a disproportionate share of the world's pharmaceuticals—47% of global pharmaceutical sales—with another 19% in Europe.⁸ Factors that contribute to drug-related greenhouse gas emissions were highlighted by one of us (CR) previously and include "overprescription, pharmaceutical waste, antibiotic resistance, routine prescriptions, non-adherence, drug dependency, lifestyle prescriptions, and drugs given due to a lack of preventive healthcare".⁹

For physicians looking for ways to improve environmental outcomes through their own clinical practices, medication non-adherence is one place to start. Estimates vary widely but non-adherence is likely to be as high as 50% for long-term therapies for chronic illnesses.¹⁰ Although such non-adherence includes prescriptions that are written but never dispensed from a pharmacy, it is prescriptions that are filled by patients but never consumed that contribute the most substantial carbon footprint.¹¹ Given the high amount of pharmaceutical carbon and the troubling problem of non-adherence, there are several ways physicians can change their prescribing behaviour to reduce health-care carbon while also improving clinical care and reducing health-care costs.

First, physicians can redouble their efforts to reduce prescriptions in certain clinical contexts, including overuse of antibiotics in viral settings, use of opioids for chronic non-cancer pain, continuation of cholesterol-lowering drugs in patients near the end of life, or use of medications for Alzheimer's disease in patients even after they have developed advanced dementia. When the American Board of Internal Medicine launched its Choosing Wisely campaign in 2012, 20% of its initial list of low-value interventions involved medications.¹² Since then a 2021 systematic review has found that 10% of low-value interventions still involve pharmaceuticals.¹³

Second, physicians can reconsider the carbon impact of some routine prescribing practices. For example, free



drug samples are widely disseminated by pharmaceutical manufacturers in certain countries, such as the USA and Canada. By refusing to take part in this marketing strategy, physicians could help reduce medication overuse and reduce the carbon impact when samples go unused. Another common practice is starting patients on 30-day medication supplies, which can lead to substantial waste if patients do not tolerate the initial doses. To avoid such waste, consideration could be given to starting patients with a 1-week supply, even at the cost of some convenience to the doctor and patient.

Third, when pharmacological management is appropriate and desired, physicians can engage in green informed consent;¹⁴ this practice incorporates education about the climate impact of pharmaceuticals and climate change health hazards. Green informed consent involves shared decision making with a broadened set of concerns to find the best treatment plans by giving patients information they might value. This approach can be justified on the grounds of respect for autonomy and patients' rights to information. Patients might choose to decline a medication, or they might choose to accept the medication and pursue carbon offsets. However, the carbon cost of medications is not readily available¹⁵ and the carbon cost of pharmaceuticals varies according to whether manufacturing was powered by coal, natural gas, or renewable electricity. Nonetheless, best estimates could be attempted and drug regulators, such as the US Food and Drug Administration and the UK National Institute for Health and Care Excellence, could work with environmental agencies to collect such information from manufacturers and make it accessible to doctors and patients.

Fourth, physicians could add climate concerns to their ongoing conversations with patients about non-adherence. Although non-adherence is a complex problem with many causes, it is certainly helpful for clinicians to have open conversations with their patients about their pill-taking behaviour. This approach is especially relevant for patients with chronic conditions who could be supported with follow-up conversations and monitoring, when indicated. Anything that reduced the number of filled-but-untaken prescriptions would reduce the carbon footprint without harming patients.

The climate crisis is a global problem that demands a response. Health-care professionals have an important part to play in reducing the carbon emissions of health care by dispensing only needed medications and by helping to ensure that those are used to their fullest potential. Each of these strategies could help mitigate health care's carbon footprint. Physicians can be climate activists in their daily clinical practice.

We declare no competing interests.

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- 1 Global Green and Healthy Hospitals Network. About GGH. 2022. <https://greenhospitals.org/about> (accessed Nov 25, 2022).
- 2 Health Care Without Harm. RISE Southeast Asia Alliance for Health and Climate. Nov 24, 2020. <https://noharm-uscanada.org/RISESoutheastAsiaLaunch> (accessed Nov 25, 2022).
- 3 Atwoli L, Baqui A, Benfield T, et al. Call for emergency action to limit global temperature increases, restore biodiversity, and protect health. *Lancet* 2021; **398**: 939–41.
- 4 Atwoli L, Erhabor GE, Gbakima AA, et al. COP27 Climate Change Conference: urgent action needed for Africa and the world. *Lancet* 2022; **400**: 1563–65.
- 5 Health Care without Harm. Health care's climate footprint. September, 2019. https://noharm-global.org/sites/default/files/documents-files/5961/HealthCaresClimateFootprint_092319.pdf (accessed Nov 25, 2022).
- 6 Sustainable Development Unit. Reducing the use of natural resources in health and social care. NHS England and Public Health England. 2018. https://networks.sustainablehealthcare.org.uk/sites/default/files/resources/20180912_Health_and_Social_Care_NRF_web.pdf (accessed Nov 25, 2022).
- 7 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; **12**: 2071–79.
- 8 Mikulic M. World pharmaceutical market distribution by submarket 2014–2021. Statista. July 27, 2022. <https://www.statista.com/statistics/266547/total-value-of-world-pharmaceutical-market-by-submarket-since-2006/> (accessed Nov 25, 2022).
- 9 Richie C. Environmental sustainability and the carbon emissions of pharmaceuticals. *J Med Ethics* 2022; **48**: 334–37.
- 10 Sabaté E. Adherence to long-term therapies: evidence for action. WHO. 2003. <https://apps.who.int/iris/bitstream/handle/10665/42682/9241545992.pdf> (accessed Nov 25, 2022).
- 11 Shrank WH. Our bulging medicine cabinets—the other side of medication nonadherence. *N Engl J Med* 2011; **364**: 1591–93.
- 12 Morden NE, Colla CH, Sequist TD, Rosenthal MB. Choosing wisely—the politics and economics of labeling low-value services. *N Engl J Med* 2014; **370**: 589–92.
- 13 Cliff B, Avancena A, Hirth R, et al. The impact of Choosing Wisely interventions on low-value medical services: a systematic review. *Milbank Q* 2021; **99**: 1024–58.
- 14 Richie C. Principles of green bioethics: sustainability in health care. East Lansing, MI: Michigan State University Press, 2019.
- 15 Hageñaars R. An investigation into the carbon and material footprint of the Dutch consumption of pharmaceuticals. MSc thesis report, Universiteit Leiden, 2022.