

Therapeutics Initiative

Better prescribing. Better health.

Reducing the adverse environmental impacts of prescribing

Vignette: A child with complex health needs takes multiple blister-packed medications and uses several inhalers. One day in your clinic or your pharmacy she asks: "What happens to all these chemicals after I put them in my mouth or breathe them in?" Her father, initially taken aback, recovers to add that he also wants to know your answer. How will you respond?

Clinicians may not consider adverse environmental impacts when they prescribe or dispense medications. But the climate crisis now makes it essential for everyone to consider impacts of anything we do, and of how we teach in health care.¹ Estimating benefits and harms when making a decision to recommend drug treatment should now include consideration of the environmental harms of that decision.

In Canada, 4.6% of total greenhouse gas (GHG) emissions are attributable to our health care system. Of this, one quarter (1.2% of GHGs) derives from drugs.² In British primary care, medications are responsible for about half of GHG emissions and about 13% comes from pressurized metered dose inhalers (pMDI).³

Producing drugs requires extraction and transport of raw materials, manufacture of finished products, packaging, shipping, and ultimately disposal of medications and wastes. Each step produces GHG emissions and contributes to air, land, and water pollution.⁴ Effluents from pharmaceutical manufacturing, drugs excreted in human and animal wastes, and drug disposal have polluted the waters of remote First Nations communities in Canada⁵ and even the Antarctic seas.^{6,7} Ecological effects of this pharmaceutical pollution are documented in waterways, aquatic species, and food chains.⁸

Packaging often constitutes much of a drug's footprint.⁴ We can avoid over-packaged promotional samples, non-essential blister "adherence" packs, and frequent dispensing. Prescribing short trials of new drugs can reduce waste of medications that are not tolerated or prove ineffective. For people on stable drug doses, pill-splitting may reduce patient and supply chain costs.⁹ Choosing intrinsically long-acting treatments (such as intra-uterine contraceptive devices) and oral instead of parenteral formulations reduces impacts. A United Kingdom analysis of diabetes treatments suggests that over 30 years, exclusive use of oral drugs would save 20% of the CO₂ emissions, compared with adding insulin for the same duration.¹⁰

How can ethical and responsible clinicians respond to the updated evidence and urgent warnings from the 2023 Intergovernmental Panel on Climate Change¹ about the dire global impacts of anthropogenic GHGs, and the other environmental pollution engendered by our daily work?



Mitigate climate impacts by conservative prescribing and deprescribing

The Lancet's 2019 report from its Commission on healthy diets from sustainable food systems recommended shifting toward plant-rich diets as a key action to address climate change and improve health.¹¹ Focusing not only on treatment but on upstream prevention, by addressing social and environmental determinants of health, is also essential to achieve a sustainable system.¹² As alternatives to reliance on pharmaceuticals, there is evidence for multiple short- and long-term health and environmental benefits to prescribing exposure to nature ("green prescriptions"),^{13,14} prescribing exercise and active transport,^{15,16} and for social prescriptions.^{17,18}

A 2015 Lancet report concluded that "tackling climate change could be the greatest global health opportunity of the 21st century."¹⁹ Reducing overuse of medications is consistent with this goal. England's Chief Pharmaceutical Officer estimated that at least 10% of all prescriptions in primary care "need not have been issued"²⁰ and noted that about 5% of 18,820 hospital admissions in Liverpool during 2001-2002 were caused by adverse drug reactions (ADRs).²¹ That estimate was updated for the month of November 2019 to 16.5% of over 1,000 hospitalizations in Liverpool resulting from or contributed to by ADRs.²²

A relatively easy and uncontroversial target for **deprescribing** is the overuse of proton pump inhibitors (PPIs).²³ Estimates for overuse of PPIs range from 40 to 65%, and PPIs can cause serious but avoidable harms in older people.²⁴ Another target is overuse of antibiotics. Antimicrobial resistance is regarded as a global health emergency,²⁵ but in the United States at least 30% of outpatient antibiotics are prescribed without an appropriate indication.²⁶ A "wait and see" approach, using deferred prescriptions or reassessment when needed, has been proven safe for some conditions like acute otitis media and common viral infections.^{27,28}



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Choosing wisely instead of overdiagnosis

Complex systemic factors and individual provider/patient dynamics can nudge clinicians toward overdiagnosis and overtreatment, but without real benefit to patients – only the risk of potential harms.²⁹ Recognizing the drivers of overprescribing helps to avoid their influence.³⁰ For example, one-quarter of long-term care residents in BC are still receiving antipsychotics without a diagnosis of psychosis.³¹ Appreciating the systemic factors that drive this makes it possible to reduce antipsychotics through coordinated quality improvement programs.³² Choosing Wisely Canada and other organizations like the Canadian Deprescribing Network offer patient and provider resources to help reduce overuse. Conservative prescribing can decrease clinical workload by reducing the need for follow-up monitoring, refill visits, and complications, all of which also have environmental impacts.

Patient education and involvement are integral to solutions

People typically take only half of their prescribed doses of medications.³³ We may assume this is due to cost, misunderstanding, or adverse drug effects. But some patients simply prefer not to take medications, and may not tell this to their prescribers.^{34,35} Such communication failures are an important cause of waste that can be remedied by asking patients “*What Matters to You?*”³⁶ and respecting patient preferences, especially in serious illness or near the end of life.³⁷ Empowering patients with information and tools for active involvement in medication choices can also improve outcomes and adherence.^{38,39}

Studies in multiple countries show that a large majority of patients agree with the statement: “*If my doctor said it was possible, I would be willing to stop one or more of my medications.*”⁴⁰ When **fully informed**, many patients opt for less, rather than more treatment.⁴¹

Shared clinical decision-making helps inform patients about options, and allows their values to guide appropriate treatment.⁴² Clinicians and patients (and their families) typically overestimate potential benefits, yet they underestimate potential harms of medications.⁴³ Rather than accepting the oft-promoted relative risk reductions from drugs and other treatments, we can better inform patients by explaining treatment benefits in absolute terms. Use **absolute risk reduction** and **number needed to treat** to illustrate potential benefits, and **absolute risk increase** and **number needed to harm** to alert patients to potential harms.⁴⁴

Storing or disposing of unused medications

Expiry dates on medications are set for marketing and legal purposes, not safety. Properly stored drugs retain most of their efficacy for many years beyond their official “expiry” date. Only tetracycline has been documented to have adverse effects after expiry.⁴⁵

Ensuring that patients understand the importance of proper disposal of drugs at the pharmacy, especially used inhalers, can reduce environmental contamination. The Health Products Stewardship Association works with community pharmacies to ensure pharmaceuticals are disposed of in the most environmentally friendly manner.⁴⁶

Switch to dry powder inhalers

The easiest and most impactful way to reduce GHGs in primary care is to assess inhaler need and technique, and switch from pressurized metered dose inhalers (pMDIs) to dry powder inhalers (DPIs).^{47,48} A United Kingdom randomized trial of 2,236 asthmatics found: “Patients switching from a pMDI-based to a DPI-based maintenance therapy more than halved their inhaler carbon footprint without loss of asthma control.”⁴⁹ The UK National Institute for Health and Care Excellence⁵⁰ and British Thoracic Society⁵¹ recommend switching to DPIs.

Hydrofluorocarbon propellants in pMDIs are 370 to 3,300 times more potent as GHGs than CO₂.⁵¹ The impact of 100 puffs of an average pMDI equals about 300 km of an average car journey.⁴⁷ In Sweden DPIs account for 87% of inhaler use,⁵² a much higher percentage than in BC.⁵³ A 2023 report in the British Columbia Medical Journal estimates that substituting DPIs for pMDIs could reduce inhaler GHGs by 78%, avoiding up to 6,600 tonnes of CO₂ emissions in the Fraser Health region alone.⁵³ It lists **clinical reasons for preferring DPIs in most patients**, shows that BC prices of DPIs are similar to pMDIs, and provides a chart ranking inhalers by their climate impact. For an interactive version with prices and PharmaCare coverage, see: www.bcinhalers.ca

Conclusions

- **Choose lower environmental impact or non-pharmacologic therapies when possible.**
- **Review medications regularly and deprescribe when appropriate.**
- **Minimize packaging and medication waste and educate patients about proper disposal.**
- **Switch from pressurized metered dose inhalers to dry powder inhalers.**

For additional content (including video) go to: www.ti.ubc.ca/letter143

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