Net zero healthcare: a call for clinician action

Health professionals are well positioned to effect change by reshaping individual practice, influencing healthcare organisations, and setting clinical standards, argue Jodi Sherman and colleagues

Achieving net zero emissions in healthcare will be possible only with radical and immediate engagement of the clinical community. The covid-19 pandemic has served as a wake-up call for high income health systems that resources are finite and globally interdependent, vulnerable to massive surges in demands and simultaneous infrastructure disruption, and that inequities in access to care threaten health and wellbeing for everyone.

During the first months of the pandemic, the medical community united at a historic pace, rapidly sharing information, redesigning models of care, conserving and innovating resources, and moving towards a circular economy. In comparison, the task of transforming healthcare culture and practice to halve healthcare emissions by 2030 as recommended by the Intergovernmental Panel on Climate Change seems entirely feasible.

Planetary healthcare
Planetary healthcare requires embracing an expanded notion of the principle “first do no harm,” beyond care for individual patients to a duty to protect the Earth’s natural systems on which intergenerational health and wellbeing depend. This planetary health lens acknowledges crucial links between ecological change, human health, and our ability to thrive.

Planetary accountability encompasses actions taken by individual health professionals within the clinical setting, collective actions of clinicians in healthcare organisations with the communities they serve, and interactions of individuals and collectives in professional societies with regulatory and oversight bodies.

For clinicians, this means recognising that healthcare consumes finite resources and produces harmful pollution, accepting that environmental stewardship is integral to our fundamental duty of care, and that we are quickly approaching a climate tipping point.

Healthcare is one of the largest polluting industries, responsible for nearly 5% of total global greenhouse gases. Like all industries, healthcare must rapidly and substantially reduce its greenhouse gas emissions to avoid the most catastrophic outcomes to health and wellbeing from climate change.

Achieving net zero emissions—that is, reducing carbon output until it is in balance with natural and engineered means of absorption—necessitates optimising the efficiency and environmental performance of healthcare delivery. However, these alone are insufficient. We must also work to reduce the incidence and severity of disease to decrease the amount and intensity of care required. Furthermore, we must match supply of health services to their need, by ensuring appropriate care and avoiding unnecessary investigations and treatments.

Coordination of care between different providers should be promoted to avoid duplication of services and reduce travel emissions and unnecessary building use.

Health professionals should encourage change through individual practice, influencing healthcare organisations, and contributing to standards and policy.

Key recommendations

- Clinicians must work to reduce the incidence and severity of disease to decrease the amount and intensity of care required.
- Use of resources must be optimised by ensuring appropriate care and avoiding unnecessary investigations and treatments.
- Coordination of care between different providers should be promoted to avoid duplication of services and reduce travel emissions and unnecessary building use.
- Health professionals should encourage change through individual practice, influencing healthcare organisations, and contributing to standards and policy.

Reducing emissions from supply of health services

Reducing emissions from healthcare services encompasses all activities that consume materials and energy. Most healthcare sustainability initiatives focus on large scale facility operations, such as improving hospital energy performance and sourcing renewable electricity, which typically are not under the control of clinicians. However, clinicians influence building use through decisions on care settings—for example, whether to administer monitoring or treatment in the home, clinic, or hospital (which has the highest resource and emissions intensity).

Virtual care for patient-provider interactions that do not require in-person examination reduces travel and clinic emissions, obviating the need for some clinical spaces, as seen in the covid-19 pandemic.

Coordination between care providers, such as through arranging multidisciplinary consultations and services on the same day, and proximal diagnostic testing, can further minimise emissions from patient travel. Such changes often require reorganisation of processes and commitment, which can be hindered by lack of understanding of the need for coordination.

The majority of health sector emissions are embedded in the supply chain, including pharmaceuticals and medical devices. Embedded emissions are dictated by materials and design, as well as production and distribution practices.

Use of organisational purchasing power and regulatory reform to influence manufacturers to reduce product emissions is critical but takes time. Clinicians have an immediate role through preferential use of lower emissions supplies (such as choosing reusable rather than single use medical devices, and dry powder
Table 1 | Examples of how clinicians can act to achieve sustainable healthcare systems under a planetary health framework

| Intervention category | Level of action | Healthcare organisation | Professional/regulatory/government |
|-----------------------|----------------|------------------------|----------------------------------|
| Reduce emissions from supply of health services | | | |
| Green infrastructure and operations | • Paperless operations | • Adhere to highest green building/retrofitting standards (e.g. Leadership in Energy and Environmental Design) | • Mandatory, standardised reporting of greenhouse gas and other emissions by healthcare organisations, reductions targets and timelines, public transparency |
| | • Optimise environmental performance of office/clinic space (energy conservation, source renewable energy, safe chemicals and cleaning supplies) | • Green roofs and natural lighting | • Ambitious building construction and performance standards |
| | • Recycling | • Optimise efficiency of clinical infrastructure (e.g. reduce medical imaging devices’ standby mode time) | • Solid waste reduction policies, zero waste targets |
| | | | • Accelerated clean energy transition |
| | | | • Food services healthy diet options, reusable containers, waste reduction strategies (e.g. people to help feed patients, just-in-time meal ordering) and waste management (biogastegors and composting) |
| | | | • Renewable energy sourcing |
| | | | • Fossil fuel divestment |
| Coordinated care delivery, integrated technology systems, and virtual care | • Offer virtual communications; select appropriate/lowest tech level | • Multidisciplinary clinics, co-locate providers and allied health/support staff resource allocation | • Universal broadband |
| | • Offer multidisciplinary consultations, coordinate care with other providers to minimise patient travel | • Information technology infrastructure and support, including integration with outside health systems to improve safety and reduce waste | • Financial incentives for integration of electronic health records, information sharing, and coordination |
| | • Coordinate care delivery as close to home as possible | • Access to translation services | • Regulation of safe adoption and use of virtual care |
| Circular supply chains | • Prescribe lowest carbon drug options | • Environmentally preferable procurement and contacting policies | • Professional guidance and facilitation to support low carbon treatments |
| | • Select reusable or environmentally preferable materials where choices exist | • Maximise medical device reprocessing programmes | • Policies to support keeping materials in use at highest value |
| | • Avoid excess material consumption | • Institute recycling programmes | • Manufacturer demonstration of need for single use devices |
| | • Adhere to evidence based infection control guidelines | • Evidence based infection prevention and control policies | • Producer responsibility for take-back programmes (e.g. packaging, electronics) |
| | • Innovate and redesign greener products | • Policies for rational use of single use devices | • Mandate manufacturing of appropriately sized drug vials and comparably priced prefilled syringes |
| | | | • Innovate and redesign greener products |
| Decarbonised transport | • Select active or low carbon transport options, encourage patients and staff to do likewise | • Provide commuter centres, carpool schemes, and subsidised public transport | • Large scale renewable energy installations/low carbon grids |
| | | • Electric vehicle fleet (owned and contracted) with renewable sources | • Safe cycling and pedestrian infrastructure |
| | | • Support structures for electric vehicles (e.g. parking spaces with free charging) | • Green active transport corridors |
| Match supply of health services to demand | | | |
| Appropriateness of care and resource stewardship | • Shared decision making and education (articulation of harms and benefits, distinguish appropriate care from rationing, beware hidden curriculum/biases) | • Decision making aids and policies to support individual providers, facilitate shared decision making | • Guidelines for shared decision making |
| | • Avoid indication/technology creep | • Technology support for care coordination | • Professional guidelines that include resource stewardship and prevention of healthcare pollution |
| | • Avoid defensive medicine | • Limit conditions of use, such as through restricted ordering and automatic stop orders | • Policies to prevent indication creep |
| | • Bayesian decision making (potential benefits should outweigh potential harms; ensure test will change management) | • Provider-level quality improvement feedback on resource use (cost and emissions) | • Incentives to drive de-adoption of low value care and health technologies |
| | • Maximise non-pharmacological and non-invasive treatment options | • Policies and institutional barriers to indication creep | • QI requirements around resource stewardship and emissions reductions for professional education and board recertification |
| | • Care coordination to avoid duplication of tests and treatments | • Protocols for de-adoption of low value care and health technologies | • Regulatory requirements and oversight of emissions reporting and reduction |
| | • Adherence to up-to-date evidence based guidelines | • Support structures for multidisciplinary care | • Payment models that discourage low value care and link stewardship with accreditation |
| | • Comprehensive, continuous resource conservation efforts | | |
| | • End-of-life acceptance and palliative care optimisation | | |
| | • Research and quality improvement project leadership around resource conservation and emissions reductions | | |

(Continued)
Table 1 | Continued

| Intervention category | Level of action | Individual practice | Healthcare organisation | Professional/regulatory/government |
|-----------------------|-----------------|---------------------|------------------------|-----------------------------------|
| Health promotion, disease prevention, and chronic disease management | Primary and community care services | • Connect patients with primary and community care, ensuring access to preventive care | • Universal healthcare | • Improve remuneration for primary care providers and reduce incentives for high volume care. |
| | | • Expand home care services, remote monitoring, virtual care | • Universal healthcare | • Develop policy to facilitate communication between acute, primary, and community services. |
| | | | | • Universal healthcare |
| | | | | • Shift care to home services |
| | | | | • Reduce demand for health services |
| | | | | • Social and nature prescribing |
| Social determinants of health | Primary and community care services | • Support an anchor mission mandate; establish community networks | • Adopt anchor mission model to connect patients with community and social services (e.g., food banks, churches, housing, income, volunteering, social and nature prescribing) |
| | | | | • Develop free, affordable clinics for the uninsured and underinsured |
| | | | | • Provide preventive services (smoking, alcohol, and illicit drug screening, counselling and cessation aids; vaccination education and provision; reproductive health) |
| | | | | • Screen for and target at risk groups for major diseases, especially those vulnerable to avoidable disease |
| | | | | • Provide diagnostic and intervention services (e.g., in chronic progressive disease) |
| | | | | • Promote staff health and wellbeing (e.g., through mental health awareness training, ethical employment practices, access to green space, encouraging active travel, and healthy diets) |
| | | | | • Social and nature prescribing |
| | | | | • Volunteer with free, affordable clinics |
| | | | | • Personalised care, co-production/patient empowerment as active partners in care |
| | | | | • Social and nature prescribing |
| | | | | • Person-centred care, co-production/patient empowerment as active partners in care |
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In light of the many harms resulting from inappropriate delivery of health services, clinical decision making should be viewed through a stewardship lens—that is, the careful and responsible management of healthcare resources entrusted to providers. Instead, evidence indicates widespread overuse of resources such as medical supplies, medications (beyond opioids and antibiotics), and laboratory and radiological investigations.

Globally, a quarter of the total volume of healthcare services is low value. Solutions include clinician education and empowerment, development of and adherence to evidence based standards of care that incorporate environmental harms, de-adoption of low value care, shared decision making, care coordination, and continuous quality improvement, all grounded in a fundamental duty of resource stewardship and care for planetary health.

Evidence and education
Formal education should include training in planetary health and stewardship principles. Continuing education is required to remain up to date on best practices, as well as indications for specific tests and interventions. The ability to critically appraise evidence, extrapolate findings to appropriate patient populations, and identify industry influence or conflicts of interest is essential to providing high value care.

By keeping their knowledge thorough and current, health professionals can protect against “technology creep”—the application of technologies or treatments to expanded indications without supporting evidence. New evidence or alternative technologies can also result in existing technologies or practices becoming inappropriate or obsolete, necessitating de-adoption strategies. A core driver of resource misuse is ignorance of the evidence and failure to change practice. This is compounded by ethical failures around resource stewardship and lack of appreciation of the rapid rate of environmental degradation and healthcare’s contribution to it.

It is also important to understand the risks and benefits of different options, including non-pharmacological and non-invasive approaches. This knowledge can help patients to have appropriate expectations of what is knowable and treatable. Rather than striving for “zero harm,” which is unattainable and results in unintended consequences, clinicians should embrace risk reduction. A risk reduction approach considers implications for both the individual patient and society, including from consumption of finite resources and pollution generation.

Health professionals must apply current evidence, critically evaluating the likelihood that results of available tests will inform management decisions or that treatments will achieve desired outcomes. If early detection has no benefit, patients should be spared the inconvenience and anxiety of close screening or surveillance and the potential harm from treating false positive findings. Effective communication is essential to dispel mistaken notions that resource stewardship is synonymous with withholding care.

Shared decision making
Shared decision making involves clinicians helping patients incorporate personal values and preferences into the weighing of risks and benefits to arrive at tailored solutions that best meet their needs. This requires an appreciation of the harms of overdiagnosis and overmedicalisation. Shared decision making embraces a biopsychosocial approach to care and honours patient goals, tending to result in less inappropriate disease focused treatment (for example, chemotherapy at end of life, and stenting in stable coronary artery disease).

Studies of shared decision making aids have shown that 20% of elective procedures would be unwanted if patients had access to understandable, relevant clinical information.

Care coordination
Inadequate communication and coordination between providers lead to duplicated and unnecessary services because of incomplete information about a patient’s history and current circumstances. Seamless and adequate communication between primary care providers and specialists, and between specialty services such as in multidisciplinary cancer teams, avoids unnecessary care, improves safety, and provides a better patient experience. Barriers to this coordination can be reduced by dedicated staff and supporting technology such as shared access to electronic health records among different healthcare organisation networks and non-affiliated practices.

Institutional structures to drive high value care
Clinicians can work with their healthcare organisations to develop and implement structures that promote adherence to evidence based best practices and discourage wasteful practices. Restrictions on antibiotic and opioid ordering, automatic stop dates on laboratory investigations, and alerts for high fresh gas flow during anaesthesia embed stewardship into electronic health records.

Institutional policies—for example, those that recommend against routine prophylaxis for stress ulcers (which data show is harmful) or restrict access to desflurane (because of its disproportionate climate impact), hasten the uptake of knowledge of harms and facilitate de-adoption of low value care. Specialist teams can standardise aspects of inpatient care and ensure up-to-date best practice through electronic decision support and benchmarking tools.

Developing clinical practice guidelines through professional societies lessens the responsibility on individual clinicians and confers a degree of medicolegal protection. Similarly, hospital policies and procedures can diffuse decision making responsibility, removing pressure that drives clinicians to practise defensive medicine or relieving ethical dilemmas around appropriate allocation of limited resources and end-of-life care, as happened in the covid-19 pandemic.

Continuous quality improvement
Environmental performance should be integrated into the core definition of quality care, with best practices established for clinicians and health systems and reinforced through regulatory and oversight processes that overcome obstacles to change. Investigations of appropriateness of care and resource consumption lend themselves to quality improvement initiatives, which can be designed, initiated, and carried out by individual clinicians within their professional settings. Electronic health records can provide feedback to clinicians on resource use, costs, and emissions, to gauge performance and drive quality improvement.

Reducing demand for health services
Reducing demand for health services requires tackling drivers of poor health. In the United States, over 50% of healthcare services are devoted to the 5% of the population with advanced chronic disease. Most advanced disease develops in people who had risk factors or early stages of illness that were preventable or reversible, often through behavioural and lifestyle approaches alone. Furthermore, healthcare services contribute to only 20% of health and wellbeing, with the remain-
under the result of broader social, economic, ecological, and political factors. However, current healthcare strategies routinely neglect social determinants of health, missing opportunities to reduce the burden, expense, and environmental effect of chronic disease. An integrative healthcare framework offers a potential solution.

Integrative healthcare is the delivery of non-pharmacological and lifestyle approaches to disease prevention and treatment in coordination with conventional treatments of chronic disease. Smoking cessation, reducing use of drugs (including alcohol), and better dietary habits, activity levels, and stress management can prevent or mitigate many chronic diseases. Evidence based approaches such as yoga, acupuncture, massage, and mind-body practices are particularly useful for pain reduction and more appropriate than medications (especially opioids) for chronic pain. As part of primary care, these approaches offer opportunities to intervene upstream in health promotion and disease prevention.

While these behavioural and social determinants are not the sole responsibility of healthcare services, helping patients better engage and manage them could go a long way towards reducing the need for more expensive and environmentally damaging interventions later.

Prescribing nature based interventions and activities such as local walking groups, community gardening, and food growing projects can help meet health needs. Benefits of green time are most researched in mental health, with protected areas worldwide estimated to be worth the equivalent of $6tn (£4tn; €5tn) annually in mental health services. Recommending patients engage socially in local community services can help tackle some of the social determinants of health such as food insecurity and social isolation.

Closing the information and practice gap

Environmental engineering tools and methods to quantify carbon and other environmental emissions are well established, and life cycle assessment is the gold standard in healthcare sustainability research. Although the emissions and public health damages from low value care are not yet known, it stands to reason that reducing unnecessary care would reduce emissions and costs, provided that the emissions intensity of required care is simultaneously reduced.

The process of mobilising the clinical community around planetary healthcare requires a concomitant investment in knowledge generation to identify environmentally preferable practices, establish evidence around high value care, and guide public policy for optimal population health. Clinicians should take the lead in advancing this research agenda, while healthcare institutions, universities, and funding bodies must support the work by prioritising planetary health mandates and providing appropriate resources.

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