



Clinical laboratory sustainability – looking forward to greener practices

How can the environmental impact of pathology services be improved?

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Author: Sheri Scott

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In this article, Sheri Scott investigates the impact of healthcare, and pathology specifically, on the environment. Key strategies are shared that can help to achieve a more sustainable and green service.

In the next 20–30 years, climate change is expected to result in at least 250,000 annual deaths.¹ As global temperatures rise and the frequency and intensity of extreme weather events increase, the resulting impact on health and the pressures on healthcare services are consequently expected to significantly increase.

The global climate health emergency links the direct impacts of extreme weather events and the indirect impacts of changes in vector- and water-borne disease transmission, aeroallergen exposure patterns, changes in air quality, wildfires and access to clean water and food resources, to a risk to public health. Furthermore, climate change is exacerbating existing health inequalities, with larger impacts seen on already vulnerable and marginalised communities. Considering the resource-intensive nature of our practice, healthcare professionals have a responsibility to review, question and address these growing concerns.

The environmental impact of healthcare

The healthcare sector is responsible for 4–5% of global greenhouse gas emissions.² This environmental impact can result from both carbon footprint – a calculated measurement of greenhouse gases, which are emitted directly or indirectly (expressed in kg CO₂ equivalents) – and non-carbon environmental impacts. The key elements of healthcare activity with a measurable carbon footprint include:

- energy use on site
- release of anaesthetic gases/nitrous oxide
- travel (staff, patients, carers)
- pharmaceuticals and medical equipment (supply chain emissions – from manufacture and distribution)
- non-medical equipment and supplies (supply chain emissions for furniture, IT equipment, laundry, etc.)
- waste disposal.

However, there are often non-carbon environmental impacts from healthcare services. These include air pollution, deforestation, landscape degradation, loss of biodiversity, depletion of scarce natural resources, bio-accumulation, toxicity and plastic pollution.

There is limited available data on the actual contribution of clinical laboratories to this environmental impact. Laboratory buildings, processes and equipment are resource-intensive. Single-use plastics are a much-needed requirement for quality and safe practice, but are also major contributors to waste generation. Automation and IT provide results with speed, accuracy and volume, but use vast amounts of energy and water. The transportation and storage of samples is an unavoidable necessity, all adding to the environmental burden.

It is, therefore, imperative that healthcare considers net zero initiatives in clinical laboratories. Laboratory leaders must take the climate health crisis into consideration in their policy development, training strategies and quality improvement programmes.

Greener laboratory practice

There are several organisations that have established experience in working to improve the environmental impact of laboratories in research and academic fields. The Laboratory Efficiency Assessment Framework (LEAF) and My Green Lab are notable examples of established assessment tools and certification ([see the article by Rob Shorten in this issue](#)).

In the last 18 months, these organisations have started to work with healthcare science professionals to look at how current green frameworks and certification can be applied to a clinical laboratory setting. Clinical laboratory professionals have started to advocate for changes in practice.

Suggestions and conclusions from experts include working towards the ISO14000 environmental standard, working on quick wins, overhauling sample transport methods and considering reducing sample throughput and waste. There is a need to consider embedding circular economy concepts into practice to promote the reuse, repair and reconditioning of products where safe to do so, thus reducing the need for primary resources and for waste disposal.³

ISO14001

ISO14001 is an international standard that sets out the requirements for an environmental management system. The purpose of this standard is to help organisations improve their environmental performance through more efficient resource use and reduction of waste. There are various tools available to help meet the requirements of this standard, such as professionally produced guidelines and frameworks.

Quick wins

Adaptions to practice can take the form of local changes in individual labs or be on a bigger scale via network collaborations. Multiple trusts have formed green groups, consisting of green champions from across a region, while other labs work more locally by making changes at individual department level. Some of the suggestions raised by pathology departments include:

- recycling bins in all labs and non-lab areas
- reviewing freezer contents regularly and discarding items not needed
- performing audits on iPads to reduce printing
- storing work logs digitally to reduce printing
- assessing the need for freezers at -80°C
- non-lab staff working from home on a rota basis
- using timers or labelling to switch off non-essential equipment when not in use
- using electronic signatures
- equipment sharing
- clearing email inboxes and using SharePoint.

Although on their own these suggestions may not seem highly impactful, taken together, and practiced in multiple departments, they can contribute to significant carbon savings.

Sample transport

The carbon footprint of travel can be considered in relation to both staff and sample transportation. Transport type, collection frequency and delivery route all contribute to the carbon footprint of the laboratory. An example of a successful change in practice is the use of reusable sample transport boxes. Several laboratories reviewed the use and disposal of sample transport bags and moved to transport samples in reusable boxes in a secure and safe manner. The change had a positive environmental benefit and also improved turnaround times, reduced the risk of sample loss and had positive financial implications.

Reducing sample numbers

In a study by McAlister *et al* (2020),⁴ the carbon footprints of 5 common hospital pathology tests were reviewed. The study suggested that the biggest contributor to the laboratory carbon footprint was the pre-analytical stage of the patient sample pathway.

There are several studies that draw particular attention to the unnecessary ordering of pathology tests and error/sample rejection figures. A considerable proportion of pathology tests ordered are thought to be unnecessary – between 12% and 44%, according to Zhi *et al* (2013).⁵ Additionally, in a systematic review by Müskens *et al* (2022),⁶ evidence demonstrated a substantial overuse of diagnostic testing across all healthcare settings.

Effective strategies to tackle the overuse of diagnostic testing are under consideration, including Getting It Right First Time (GIRFT). However, evidence still needs to be collected to obtain a better understanding of the extent of diagnostic testing overuse.

The future

In the past year, a collaborative group convened by the Association of Laboratory Medicine (previously the Association of Clinical Biochemists) has come together and is actively promoting the green labs agenda. Working with other key stakeholders from the Royal College of Pathologists, the Institute of Biomedical Science and Greener NHS, we are collaboratively facilitating awareness, providing education and sharing best practice. We have co-organised the first lab leaders' green labs education and discussion symposium and are actively working to embed sustainability education across all professions involved in clinical laboratory practice.

As part of this work, we hope to raise awareness of the climate health emergency and signpost professionals to the [Sustainability in Quality Improvement initiative](#), developed by the Centre for Sustainable Healthcare. This programme equips health professionals with skills to foster a more environmentally, socially and financially sustainable health service by integrating sustainability into quality improvement.⁷

[References available on our website.](#)

Meet the author



SHERI SCOTT

PRINCIPAL LECTURER AND BIOMEDICAL SCIENCE COURSES MANAGER AT NOTTINGHAM TRENT UNIVERSITY

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London E1 8QT

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Tel: +44 (0) 20 7451 6700

Email: info@rcpath.org

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