

CPD

Environmentally sustainable dermatology

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doi:10.1111/ced.14516

Summary

In 2017, health and social care organizations contributed 6.3% of carbon emissions in England. Efforts to reduce the environmental footprint of the National Health Service (NHS) have been broadly focused on reducing demand, through prevention and patient empowerment, and modifying supply side factors by focusing on lean care systems and low carbon alternatives. This narrative review concentrates on supply side factors to identify sustainable practices with a focus on actions that could be implemented in dermatology departments. For this study, a literature review was conducted in MEDLINE in April 2020. The search terms included 'environmental sustainability' and 'climate change' with 'dermatology', 'telemedicine', 'NHS', 'surgery' and 'operating theatres'. Out of 95 results, 20 were deemed relevant to the review. Although the review showed that there is clearly growing interest in environmental sustainability, the identified literature lacked examples of comprehensive implementation and evaluation of initiatives. The literature discussed distinct areas including transport, waste management and procurement as part of a lean health-care system. A number of papers highlighted the potential contribution of carbon-reducing actions without citing verifiable outcome data. This narrative review highlights the need for detailed environmental impact assessments of treatment options in dermatology, in tandem with economic analysis. In conclusion, we have identified a clear need for evidence-based guidance setting out implementable actions with identifiable benefits achievable within local clinical teams. This will require engagement between clinicians, patients and healthcare organizations.

Introduction

In 2008, the Climate Change Act set a target of 34% reduction in National Health Service (NHS) carbon emissions by 2020. NHS England reported carbon emissions of 27.1 million tonnes from the health and social care system in 2017, equating to 6.3% of England emissions.¹ The NHS has a responsibility in terms of its size and impact on the environment to help address climate change, and it also has self-interest due to the associated negative health consequences.

The impact of climate change on skin disease may include changing geographical areas of cutaneous infections, an increase in inflammatory skin disorders due to increased human contact with organisms causing dermatitis, and an increase in skin cancer incidence.²

In 2010, the Centre for Sustainable Healthcare (CSH) set out four key principles:³ (i) prevention; (ii) patient empowerment; (iii) lean care systems; and (iv) low carbon alternatives. The aim of this narrative review was to systematically investigate lean care

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Conflict of interest: the authors declare that they have no conflicts of interest.

Accepted for publication 17 November 2020

systems and low carbon alternatives with a focus on dermatology.

Methods

A literature search was conducted in MEDLINE on 27 April 2020 using the search terms 'environmental sustainability' and 'climate change' combined with 'NHS', 'dermatology', 'surgery', 'operating theatre' and 'telemedicine' (Supplementary Table S1). Further searches using the words 'carbon' and 'lean health-care systems' were tested; however, these revealed duplicate results and papers focused on economic sustainability respectively. No time duration was set, owing to the limited number of results in initial searches. Inclusion criteria included papers in English that discussed lean care systems and low carbon alternatives in settings relevant to dermatology with practical suggestions to improve sustainability. The titles and abstracts were screened by both authors for relevancy and a final selection of references was created. The cited articles and references were reviewed to further identify relevant literature.

Results

The MEDLINE searches returned 95 results (2 duplicates), while further research through Google and all cited articles identified 2 additional sources. Most published papers were opinion papers and case studies. The primary reason for exclusion during screening was a focus on the effect climate change will have on healthcare. Five records were excluded because they lacked specific proposals. Out of the 95 results, 75 were excluded using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework (Fig. S1), resulting in a final sample of 20 papers (Table 1).

Discussion

There is a growing interest in environmental stewardship within healthcare systems. In the UK, support is available from the NHS Sustainable Development Unit as well as the CSH.

Low-carbon healthcare is focused on designing, building and operating health systems with minimal carbon emissions.⁴ Only one study that looked at the carbon footprint of a dermatology procedure was identified.⁵ This study investigated Mohs micrographic surgery (MMS) and calculated that annual carbon emissions from material waste alone were 26 kg

carbon dioxide equivalent (CO₂eq) for one treatment centre. When extrapolated to the 25 UK MMS centres the estimated annual emission level was 644 kg CO₂eq.⁵ Although that study has limitations, it enabled changes to be implemented to reduce the environmental footprint, including reviewing equipment packs and recycling.

Lean care systems are used in healthcare to provide better, safer healthcare in the least wasteful way.⁶ Given the ubiquity of skin disease, there are clear benefits of using lean care systems in dermatology⁷ and reducing energy consumption will have knock-on financial benefits.⁸ We describe how lean care systems may reduce carbon consumption in dermatology, through travel reduction and the use of telemedicine and by reducing waste.

Travel of patients, visitors and staff accounts for 18% of healthcare greenhouse gas emissions.⁹ Providing healthcare closer to home is recommended to reduce patient travel distances.^{10,11} Staff car travel should be reduced by recruiting local staff where possible,¹² encouraging car sharing schemes and bicycle parking spaces, and rewarding staff who make changes. Travel reimbursement should reward staff using low carbon or electric cars.⁹ It is also important to highlight the associated health benefits of increased physical activity, reduced congestion and pollution.^{8,13}

One intervention to reduce travel is the increased use of telemedicine. This not only has environmental benefits, but reduces the impact of appointments on patients' daily lives with reduced stress and travel costs.^{11,14} Telemedicine is particularly relevant in rural communities where dermatology services may not be available locally and travel costs are significantly higher.¹⁵ The use of videoconferencing in dermatology has the potential to reduce hospital referrals by up to 72%.¹⁶ A teledermatology programme in the Catalan region was able to reduce face-to-face consultations by 69%.¹⁷ That study reported economic savings in addition to an estimated reduction in carbon emissions by 21 tonnes over 18 months. The potential carbon reduction is dependent on the average distance that patients or healthcare professionals travel.¹⁸ Considering the energy consumption of the information and communications technology used, and assuming an appointment of 60 min, video consultations would achieve carbon reductions for any patient travelling over 3.6 km.¹⁹ As appointments are typically shorter, the proportional carbon associated with travel would be higher and therefore video consultations would have correspondingly higher benefits. However, these benefits may not be applicable to urban dermatology

Table 1 Final literature sample and description of methods and applicability to literature review.

Reference	Method	Applicability
Climate change OR environmental sustainability AND surgery OR operating theatre		
Wyssusek <i>et al.</i> , 2019 ²²	Literature review	Specific to waste management
Guetter <i>et al.</i> , 2018 ²⁷	Literature review	Emphasis on reduction, reuse, rethinking, research and renewable energies
Climate change OR environmental sustainability AND dermatology		
Coates <i>et al.</i> , 2019 ²⁸	Viewpoint article	Focused on the problems surrounding climate change and healthcare but did not offer any practical steps to make improvements
Rosenbach, 2019 ²⁹	Viewpoint article	Detailed discussion regarding climate change and how this applies to dermatology without providing strategies for improvements
Climate change OR environmental sustainability AND NHS		
Sainsbury <i>et al.</i> , 2019 ¹³	Viewpoint article	Based on presentations given by Dr David Pencheon, founder of the NHS SDU, following a visit to Australia
Tomson, 2015 ⁹	No methodology section included; takes the format of a literature review	Summary of UK guides with detailed suggestions on several aspects of environmental healthcare; highly applicable
Pollard <i>et al.</i> , 2013 ³⁰	Original research	Mathematical model to quantify the carbon footprint of healthcare systems including theoretical changes. Limitations through simplifying assumptions
Grose and Richardson, 2013 ²⁴	Original research using interviews with health sector senior managers	Individual participants provided anecdotal suggestions based on their experiences
Wootton <i>et al.</i> , 2010 ¹⁶	Literature review	Focuses on patient, staff and visitor travel and theoretical implementation
Pencheon <i>et al.</i> , 2009 ⁸	Case study	Comparing SDU strategies to those used in the Australian healthcare system
Pearson, 2008 ²¹	News article	Detailed article regarding NHS plans including quotations from hospital trusts
Griffiths, 2006 ¹²	Mini-symposium updating MSc dissertation with previous literature review and interviews	Includes eight-point checklist to improve environmental sustainability
Climate change OR environmental sustainability AND telemedicine		
Vidal-Alaball <i>et al.</i> , 2019 ¹⁷	Original research	Reviewing a telemedicine programme and its benefits. Unlike other studies, this is not based just on a theoretical model
Holmner <i>et al.</i> , 2014 ¹⁹	Original research	Assessed carbon footprint of teleconsultations by comparing ICT energy usage to quantify potential benefits of telemedicine
Ellis <i>et al.</i> , 2013 ¹⁵	Original research	Questionnaires and travel data to calculate potential benefits from a telehealth programme
Holmner <i>et al.</i> , 2012 ¹⁸	Literature review	Thoroughly explores telemedicine applications with detailed benefits and limitations
Yellowlees <i>et al.</i> , 2010 ¹⁴	Viewpoint article	Detailed article analysing the US health industry and potential applications of telemedicine
Lewis <i>et al.</i> , 2009 ²⁰	Original research	Highly applicable: based on South West Wales Cancer Network using videoconferencing, which could be applied to dermatology services
Additional records identified through other sources		
Hensher, 2020 ²⁶	Original research	Detailed economic calculations of environmental impact and how these should be incorporated into existing practices. Not specific to dermatology
Wernham <i>et al.</i> , 2019 ⁵	Original research	Short supplementary article. Quantitative measure of environmental impact; however, restricted to material waste

NHS, National Health Service; SDU, Sustainable Development Unit.

services. Another aspect of telehealthcare is the use of videoconferencing for professional meetings. A survey of the South West Wales Cancer Network showed that changing to videoconferencing for > 90 people to attend 30 meetings, a reduction of 2590 kg CO₂ was made.²⁰

Appropriate waste segregation has environmental and economic advantages; improving recycling not only reduces carbon emissions from incineration of waste, but can reduce road miles through working with local waste companies.²¹ A significant proportion of clinical waste produced in theatres could be

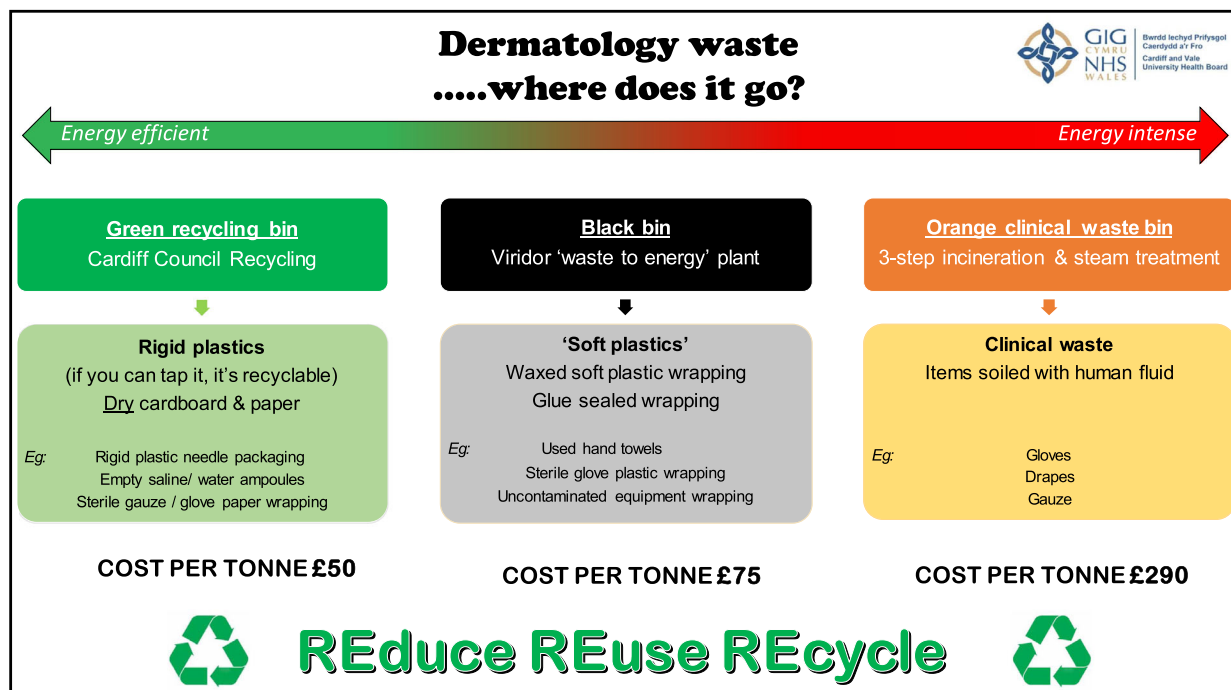


Figure 1 Waste poster for dermatology department.

recycled; however, cardboard, paper and recyclable plastics are often included in the general or even clinical waste.²² Measures to improve segregation of waste include liaising with local recycling services, using clear signs on bins (Fig. 1)

and reviewing bin location. The World Health Organization estimates that 2–3 million skin cancers are diagnosed each year.²³ These will mostly be treated by excision, resulting in surgical waste, which should be appropriately recycled (Fig. 1)

Over a fifth (22%) of the NHS carbon footprint is related to the procurement of pharmaceuticals.⁹ Despite external pressures that may not be easily influenced by individual specialities, there may be opportunities for choosing more local suppliers to reduce transport costs and carbon emissions.²⁴ The average cost of a wasted prescription for 4 weeks is £34 (15 kg CO₂eq) based on manufacturing processes, materials and packaging.¹¹ This is comparable to 88 km in an average car releasing 0.17 kg CO₂eq/ km.²⁵ Simple steps may be adopted, such as monitoring expiry dates for medications held in the department and using 'starter packs' to provide a short supply of a treatment to prevent excessive waste if the patient does not tolerate it.⁹ For

example, samples of emollients should be offered for patients to try before prescribing larger quantities.

Conclusion

This review has identified examples of environmentally sustainable evidence-based practice relevant to dermatology, mainly through theoretical models rather than researched outcomes.

In the future, environmental consequences should be considered in dermatology service evaluations. Data on carbon emissions should be incorporated into an economic evaluation, initially by completing an Environmental Impact Assessment, to provide an overview of material impacts.²⁶

Further research is needed to determine comprehensive evidence-based practice with defined benefits that teams can adopt and embed into operational practice. In the meantime, dermatology departments should encourage sustainable travel and review equipment packs, pharmaceuticals and local waste management. The SARS-CoV-2 pandemic has driven the use of tele-dermatology and videoconferencing, which should now be embedded into dermatology services.

Learning points

- The NHS is a key contributor to UK greenhouse gas emissions.
- The NHS is beginning to respond to tackle carbon reductions; however, there is limited evidence available.
- In dermatology, opportunities exist in areas such as telemedicine, pharmaceuticals and procedural waste.
- Environmental sustainability needs to be given equal prominence with financial sustainability in reviewing new ways of working.

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CPD questions

Learning objective

To gain knowledge on the impact the healthcare system has on the environment and to understand the principles of sustainable healthcare delivery, focusing on lean healthcare systems and low carbon alternatives.

Question 1

What proportion of healthcare greenhouse gas emissions is attributable to healthcare-associated travel?

- (a) 1.7%.
- (b) 3.1%.
- (c) 13.2%.
- (d) 16.2%.
- (e) 18.7%.

Question 2

Which of the following is a supply-side carbon-reducing action?

- (a) Improving patient literature.
- (b) Patient education programmes.
- (c) Patient empowerment.
- (d) Sun-aware health promotion scheme.
- (e) Using medication starter packs.

Question 3

Videoconferencing has been shown to reduce hospital referrals by how much?

- (a) 25%.
- (b) 37%.
- (c) 58%.
- (d) 72%.
- (e) 80%.

Question 4

In 2017, how much did English health and social care providers contribute to carbon emissions in England?

- (a) 3.4%.
- (b) 6.3%.
- (c) 8.5%.
- (d) 12.1%.
- (e) 14.0%.

Question 5

What is the unit, set up in 2008, to lead on environmental issues in the National Health Service (NHS) in England?

- (a) Centre for Sustainable Healthcare.
- (b) Environment Agency.
- (c) Green Alliance.
- (d) Health and Environment Alliance.
- (e) Sustainable Development Unit.

Instructions for answering questions

This learning activity is freely available online at <http://www.wileyhealthlearning.com/ced>

Users are encouraged to

- Read the article in print or online, paying particular attention to the learning points and any author conflict of interest disclosures.
- Reflect on the article.
- Register or login online at <http://www.wileyhealthlearning.com/ced> and answer the CPD questions..
- Complete the required evaluation component of the activity.

Once the test is passed, you will receive a certificate and the learning activity can be added to your RCP CPD diary as a self-certified entry.

This activity will be available for CPD credit for 2 years following its publication date. At that time, it will be reviewed and potentially updated and extended for an additional period.

Supporting Information

Additional Supporting Information may be found in the online version of this article:

Table S1. Full search terms.