Sustainability in diabetes care: building an environment for change

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Abstract

Sustainability is increasing with regard to its recognition and consideration in healthcare – from a policy level through to clinical practice. The implications for the environment and the healthcare system make the understanding of what sustainability means and how best to achieve it all the more important. The healthcare considerations have generally been broad, covering healthcare as a whole, but more interest in grassroots change and specialty-specific understanding is developing. This article aims to highlight some of the key concepts when discussing sustainability, with a specific focus on the field of diabetes and clinical care. It additionally provides possible considerations about how to develop sustainable practice and diabetes care-specific considerations.

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Introduction

The drive towards carbon neutrality has taken up a key position in the current political climate, from governmental policy through to food consumption, choices and of course healthcare. The NHS aims to be the first fully carbon-neutral healthcare system in the world. The initial focus has been on more top-down approaches focusing on NHS consumption and utilisation of energy and the more disease- specific interventions have taken a back seat, with the exception of inhalers in respiratory medicine and anaesthetic gas use. As the prevalence of multiple long-term conditions increases, the interventions required and considerations of contributing to the carbon neutrality from a disease-specific perspective, such as diabetes care, come more into focus. This article aims to provide some insights into the understanding of sustainability in healthcare and the role of sustainability in diabetes care specifically, from the perspective both of healthcare professionals and the pharmaceutical industry.

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What is sustainability?

It is well known that both production and provision of healthcare and healthcare material have an impact on the environment through greenhouse gas emissions, air or water pollution and waste production. This contributes to poorer population health through increases in respiratory and cardiovascular disease and extremes of weather and their subsequent impact on health conditions.[1] The term 'sustainability' has been utilised in the setting of the environment for some time. One simple definition stated by the United Nations Brundtland Commission in 1987 was 'meeting the needs of the present without compromising the ability of future generations to meet their own needs', which perhaps could be considered vague in specifics.[2] A more detailed definition originates from the UCLA Sustainability Committee: '*The integration of environmental health, social equity and economic vitality in order to create thriving, healthy, diverse and resilient communities for this generation and generations to come. The practice of sustainability recognizes how these issues are interconnected and requires a systems approach and an acknowledgement of complexity*'.[3]

There are various considerations to the term 'sustainability' and what is meant when discussing this. There could be sustainability in services, workforce, policy and decision-making and the healthcare environment as a whole. Typically, sustainability is synonymous with environmental impact and usually involves recycling. However, it is important to realise that recycling forms only one part of the bigger picture. To truly understand the environmental impact of a product, a whole product lifecycle assessment must be carried out. Some of the key terms to consider are defined in Table 1.

Table 1. Key terms to consider in sustainability

Circular economy	A method of extending the lifecycle of a product to ensure minimal wastage (can involve re-using, refurbishing, recycling and more)
Sustainability	Meeting the needs of the present without compromising the ability of future generations to meet their own needs
PPM	Parts per million, typically used to assess carbon emission
Net zero	The balance between greenhouse gases produced and removed in the environment
Product lifecycle assessment	Measuring the environmental impact of a product throughout its lifecycle from creation to supply and waste

The NHS Greener agenda

Health care has a significant impact on the environment and specifically on carbon emissions. Some estimates suggest that it contributes to 5% of the UK's carbon footprint and that manufacturing, supply and pharmaceutical usage account for one quarter of the NHS's total carbon footprint.[4,5] Of this contribution, 20% comes from medicines and chemicals, 10% from medical equipment and 8% from non-medical equipment. Anaesthetic gases and inhalers account for 5%, as do water and waste, with 10% from building energy. Travel and commuting make a smaller contribution, with 5% from patient travel, 4% from staff commuting and 1% from visitor travel.[6]

NHS England has committed to becoming the world's first 'net zero' national health service and has set two key main objectives. It aims to reach net zero by 2040, with 80% reduction by 2028-2032 for emissions controlled directly (NHS Carbon footprint). For emissions that can be influenced (NHS Carbon footprint plus), the aim is to reach net zero by 2045, with 80% reduction by 2036-2039.[7]

NHS England has defined three main Scopes to target: Scope 1, direct emissions from owned or directly controlled sources on site; Scope 2, indirect emissions from generation of energy purchased (majority electric); and Scope 3, all other indirect emissions occurring from the production and transportation of goods and services. It is important to note that there are some areas that fall outside this, such as patient and visitor travel. Scope 1 has been the main focus and comprises utilisation of fossil fuels, emissions from NHS facilities, NHS fleet and leased vehicles and anaesthetics. Scope 2 covers mostly electricity usage and Scope 3 a multitude of areas such as medicines, medical devices, freight transport, water, waste, inhalers, catering and staff commuting. The NHS Greener team has been tasked with delivering on this target. For the most part they are targeting Scope 1 first though this does not mean that grassroot level initiatives cannot be explored and upscaled.

Pharmaceutical industry and sustainability

Whilst the focus for the NHS has been the above-mentioned scopes, the role and impact of the pharmaceutical industry cannot be ignored. In fact, the involvement and importance of engagement between the NHS, government and the pharmaceutical industry has been highlighted by the ABPI as key to accelerate progress in sustainability.[8] When looking at a pharmaceutical product, a product lifecycle assessment gives key insights into its contributions to carbon emissions. Some 40-80% comes even before the product reaches the patient and most of that is related to creating the Active Pharmaceutical Ingredient (API) from research and development; only about 2% comes from repurposing or recycling.[6]

The industry has committed to reducing its environmental impact although it is acknowledged that this may be easier said than done. Five main challenges when considering sustainability for the pharmaceutical industry have been highlighted:

- **Priorities**: It is difficult to change processes quickly to increase sustainability while maintaining product safety.
- **Complex supply chains**: Due to high regulatory standards, complex global supply chains and numbers of stakeholders are involved. Collaboration and coordination are required.
- **Waste-to-product ratio, overprescribing and concordance:** Resource intensity of pharmaceutical manufacturing and low success rates in pharmaceutical R&D together with product user factors.
- **Moving targets/innovation**: There is a continued need to innovate in order to deliver medicines. Future technologies are likely to have a different environmental impact profile compared to established ones, creating a moving target for sustainability.
- **Healthcare systems do not currently reward sustainability**

The pharmaceutical industry has started work on this process through the Sustainable Markets Initiative (SMI) – a collaboration between various pharmaceutical companies, government and academic institutions.[9] Seven main levers to reduce carbon emissions in care pathways have been highlighted:

- Decarbonising facilities and fleets
- Preventing disease onset
- Diagnosing early
- Optimising disease management
- Improving the efficiency of interventions
- Delivering care remotely or closer to home
- Using lower-emission treatments

Adopting a truly collaborative approach with key organisations is perhaps the likeliest method for success. However, the outputs and outcomes, as well as further details, are awaited.

Diabetes care and sustainability

Diabetes appears to be one of the key long-term conditions that might be ideal for a sustainability initiative given its prevalence but also the resources utilisation from multiple appointments and travel through to medications and the distinct phases of the condition from predisposing risk factors (specifically in the setting of type 2 diabetes [T2DM]), to diagnosis and development of complications and their impact. The SMI does specifically mention T2DM in decarbonising patient pathways. Looking at some of the key levers in reducing carbon emissions, it becomes quite clear why – preventing disease onset in the setting of those at risk of T2DM, diagnosing early in the form of targeting at-risk groups, optimising disease management and efficiency of interventions by optimising HbA_{1c}, medication usage (and reducing wastage) and screening/reducing the risk of complications.

From a person-centred perspective, beyond the interest in the environment and resources, it is important to acknowledge the impact that carbon emissions may have on their condition. Observational data suggest that pollution is associated with an increased risk of T2DM and that food insecurity from weather changes may lead to greater processed food consumption and obesity.[10,11] Extremes of temperature also may have an impact, with extreme heat leading to an increase in diabetes-related hospital admissions and even mortality.[12,13] Conversely, extreme cold temperatures have implications for those with diabetes: people with diabetes are shown to have increased susceptibility

to colder weather, increased mortality and deterioration in HbA_{1c}.[14-16] Improving sustainability in patient care therefore may have more direct health effects/implications beyond the focus on the healthcare economy and carbon emissions.

There is limited evidence for interventions to reduce carbon emissions but there are modelling data looking at the impact on the environment of optimising diabetes care and reducing complications. In one paper by Fordham *et al*, the impact on carbon emissions from maintaining HbA_{1c} at 7% (53mmol/mol) or reducing HbA_{1c} by 1% (11mmol/mol) was modelled utilising two cohorts – those on first-line medical therapy (cohort 1) and those on third-line medical therapy (cohort 2). The authors found that maintaining HbA_{1c} reduced total CO2e/patient by 18% (1,546 kgCO2e/patient) vs 13% (937 kgCO2e/patient) and led to a reduction in CO2e/LY gain of 15%–20%. Additionally, reducing HbA_{1c} by 1% caused a 12% and 9% reduction in CO2e/patient with a CO2e/LY gain reduction of 11%–14%.[17]

This is echoed by the SMI, which uses T2DM as an example of how to impact carbon emissions. They reviewed the impact on emissions of developing complications and found that the emissions for managing a patient on dialysis with late-stage kidney disease were 70 times greater than for a patient on insulin therapy and 200 times greater than a patient on oral medications. They further assessed that in a cohort of 10,000 patients with 'pre-diabetes', 15% would develop renal or cardiovascular complications which would account for 50% of lifetime carbon emissions of the entire cohort. Additionally, preventing T2DM in this cohort with 'pre-diabetes' would reduce carbon emissions by 34%. This provides compelling evidence for the importance of risk reduction and avoidance of complications from a carbon emission point of view.[6,18]

Proposed interventions and future considerations

There are various possible interventions to address sustainability in healthcare but diabetes care specifically is considered here. Various pharmaceutical industries are already examining the impact of their products and practices on sustainability and have undertaken full sustainability reviews and initiatives to achieve net zero on carbon emissions as well as full product lifecycle assessments. They are possibly ahead of the curve compared to the NHS in targeting disease-specific areas/diabetes.[19-21]

Notable examples of reducing environmental impact include: a recycling scheme by Novo Nordisk, Sanofi being recognised as one of the leading companies on sustainability through international awards as well as supporting local recognition through awards for sustainable initiatives in diabetes, and both Abbott and Dexcom reducing plastic usage in their devices (though battery usage does require recycling consideration and is not currently offered).[22-26] Further afield, an initiative in Denmark involving Merck, Eli Lilly, Novo Nordisk and Sanofi undertakes a true cross-industry initiative on recycling insulin pens,[27] and may be something that will highlight practical cross-industry collaboration in diabetes care though data on the impact of these initiatives on carbon emissions remain to be seen. Whilst reducing wastage and recycling is an important consideration, it should also be put in perspective since major changes in research and development and supply chains form a larger part of the contribution to carbon emissions. Therefore more focus on this area may have a greater impact.

Table 2. Suggested practices to improve sustainability in diabetes care

Improving sustainability in diabetes care	
Diabetes-specific interventions	**Other considerations**
T2DM prevention	Virtual consultations where appropriate
Optimal glycaemic control/ management	Awareness of electricity usage in clinic rooms and ensuring minimal wastage when not used
Prevention of complications of diabetes	Paperless documentation
Optimising therapy/medication reviews to avoid overtreatment/ aid concordance	Consideration of sustainable practices in policy locally and nationally
Reusable insulin pen use	Procurement based on sustainable practices
Recycling of packaging including insulin pens and glucose monitoring devices	Minimising wastage in the clinical environment
Involving patients proactively in sustainability discussions	Minimise inter-site travel

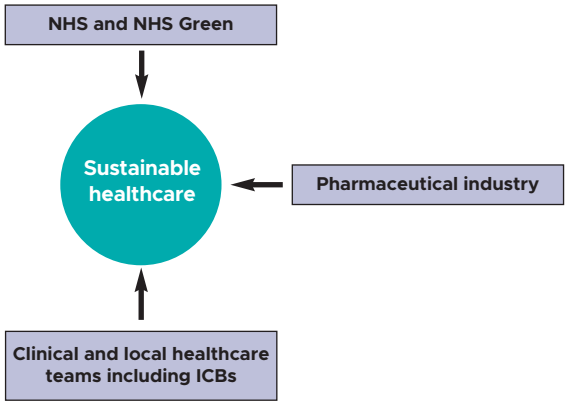
From a clinical perspective, the foundation of improving sustainability is through improving prompt and timely clinical care in reducing new-onset T2DM, progression of existing diabetes and avoiding complications, as reinforced by modelling data discussed earlier. There are other considerations, some diabetes-specific and others general healthcare/sustainability-related. Table 2 highlights a few considerations.

The impact of 'good diabetes care' on emissions has been previously discussed. Any steps towards T2DM prevention and also optimal care for those with existing T2DM and remission will contribute to reducing healthcare utilisation and therefore emissions. Prioritisation of re-usable insulin pens over disposable where possible and recycling insulin pens and monitoring devices will reduce medication-related wastage and plastic usage and are relatively simple changes to be made by both clinicians and people with diabetes.

The COVID pandemic accelerated the use of virtual technology to deliver clinics and this technology should be continued where appropriate to reduce the environmental impact of travel to consultations. Similarly, considerations in the clinic room include responsible electricity usage and reducing paper wastage, especially with the focus on paperless hospital systems.

Larger-scale cultural changes by organisations such as favouring sustainable practice through recycling and reducing wastage, prioritisation of sustainable practices at a policy level to include procurement based on a supplier's carbon footprint and education of all involved would make sustainability commonplace in the NHS and specifically diabetes care.

Figure 1. Key organisations required to deliver sustainable healthcare in the NHS



Key messages

- Healthcare has a significant impact on the environment and specifically on carbon emissions
- Healthcare contributes to 5% of the UK's carbon footprint and manufacturing, supply and pharmaceutical usage account for a quarter of the NHS's total carbon footprint
- There are various strategies to reduce carbon emissions in diabetes care including the impact of HbA_{1c} improvement and optimising care
- Cross NHS and industry collaboration is imperative to develop sustainable methods to reduce carbon emissions

In terms of future considerations, it is imperative that cross-industry and NHS collaboration be promoted and that governmental funding is present to drive sustainable progress in healthcare (Figure 1). Research into the impact of interventions and sustainability as a focus in policy and NHS decision-making processes, including procurement, may be other considerations to reinforce sustainability. Clinical research beyond modelling data but into the real-world impact of interventions or sustainable activities on people with diabetes (including their perspectives) and the health system specifically in diabetes care may provide more data in this evidence-poor area.

Conclusion

There can be no doubt that the time to act, develop and reinforce sustainable healthcare is now. Rather than wait for a top-down approach it is important that clinicians and all who are involved in diabetes care look towards methods to deliver this locally and beyond in order to improve the future for all, not just those with diabetes. Optimal clinical care, prevention strategies as well as policy and other sustainability-focused interventions are some of the key areas that can be undertaken. Cross-collaboration with government, industry and the NHS (as well as people with diabetes) with the shared common goal of sustainability is probably one of the key aspects in diabetes care to make larger-scale changes though this should not delay more grassroot approaches.

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