Quantification of Respiratory Inhaler Carbon Footprint in primary care prescribing

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Introduction

The impact of climate change on health is increasing, as global warming continues to rise. [1]

The NHS Long Term Plan (LTP) sets a target of '51% reduction in the carbon footprint by 2025' for the Health and Social Care Sector, as part of the Climate Change Act. [2] Furthermore, the Sustainable Development Unit (SDU), a collaboration of NHS England (NHSE) and Public Health England (PHE) identified pharmaceuticals as a 'hot spot' accounting for 22% of the NHSE carbon footprint [3] with pressurised metered dose inhalers (pMDIs) and breath-actuated pMDIs (BA-pMDIs) contributing 3.2%. [4]

To meet the Climate Change Act targets, the NHS LTP outlines that 4% of the total NHS carbon footprint savings are expected to be realised through a 'shift to lower carbon inhalers' equivalent to a 50% reduction in the total inhaler carbon footprint. [2,5,6]

Independently verified manufacturer product carbon footprint (PCF) certificates are available for some, but not all, of the commercially available inhalers. There are also several review publications which report on inhaler carbon footprints. [7-10]

AIM & OBJECTIVES

Aim:

- To quantify the inhaler carbon footprint in primary care.

Objectives:

- To assign a carbon footprint for all respiratory inhalers and refills.
- To provide this information alongside the primary care prescribing costs for all RDTC stakeholder Clinical Commissioning Groups (CCGs) in the form of a calculator.

METHOD

Development of the RDTC carbon footprint calculator

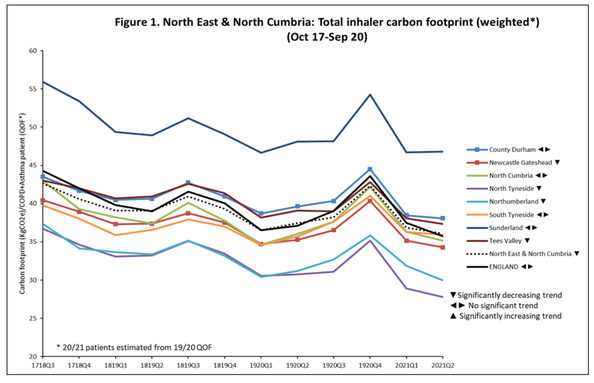
- Collation of the available manufacturer Product Carbon Footprint (PCF) data, primary research papers and formulation specifics to generate a set of assumptions which enables carbon footprint values to be estimated for all currently available inhalers.
- Estimated carbon footprints communicated to inhaler manufacturers.
- Primary care inhaler prescribing data (ePACT2) collated detailing usage and costs.
- Engagement across the region with a stakeholder group comprising respiratory specialists, medicines optimisation pharmacists and prescribers.
- Development of the RDTC Inhaler carbon impact assessment spreadsheet tool [11] by a team of pharmacists, data analysts and a statistician.

RESULTS

Application of this calculator identified that:

- In the North East & North Cumbria (NENC) CCGs, Inhaler carbon footprints (Jul-Sep 20/21) weighted for the number of Asthma & COPD patients range from 27.8 kgCO2e – 46.8 KgCO2e (Figure 1).
- The NENC footprint average is 36.1 KgCO2e vs the England average of 35.8 KgCO2e.
- Based on a target of 50% reduction of England's total Inhaler carbon footprint, it is possible to calculate a national target of 19.3 KgCO2e average per asthma & COPD patient in England per quarter.

Figure 1. North East & North Cumbria: Total inhaler carbon footprint (weighted*) (Oct 17-Sep 20)



- The largest proportion of the carbon footprint is primarily due to SABA Inhalers, followed by 'ICS/LABA' combination Inhalers and 'ICS' Inhalers (Figure 2).

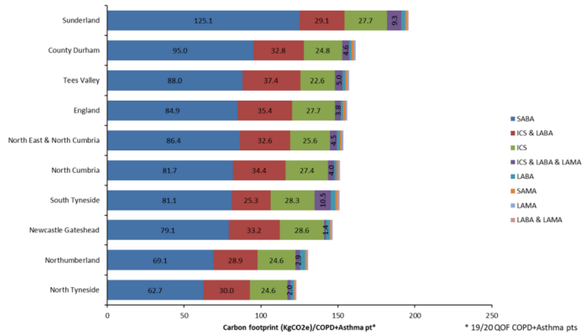


Figure 2. North East & North Cumbria; Weighted Inhaler carbon footprint by therapeutic class (Oct 19-Sept 20).

- There is a significant positive correlation (0.422, p = 0.012) between the number of hospital admissions for asthma and the total carbon footprint (per respiratory patient); seen predominantly as high SABA use.[14]

Subsequent analysis from a review of refill prescribing for Spiriva® Respimat® 2.5mcg and Spiriva® Handihaler® 18mcg (30 pack) Identified that:

- NENC ICS footprint could save 12,258 KgCO2e and 22,531 KgCO2e annually by using refills as per the manufacturer's directions, for the respective devices.
- It is estimated that pMDIs have on average between 20% through [12] and 50% [13] of propellant/doses remaining on disposal by patients, which will be emitted into the atmosphere if these inhalers go into landfill. [12]

Real outcome:

- If patients were supported with education to reduce the number of wasted doses/inhaler on disposal, it is estimated that a 20% improved efficiency of the inhalers currently prescribed in the NENC would release an annual carbon footprint and financial saving of 9,344,157 KgCO2e and £5.1 million respectively.
- A focus on patients who overuse SABAs is warranted both for better respiratory outcomes for the patient, and reduced carbon footprint.

CONCLUSION

- The RDTC has developed a calculator, which quantifies respiratory inhaler carbon footprints against the financial impact of each inhaler choice
- The calculator is intended for use by medicines optimisation teams involved in strategic sustainability planning, enabling more detailed analysis of inhaler prescribing across systems.

Future development:

- The calculator can be utilised to identify inappropriate use of inhalers by patients e.g. over or underuse.
- This will enable systems to undertake a population health approach to improve outcomes in respiratory prescribing through a more targeted intervention.
- The inclusion of secondary care data will enable an integrated care system approach to inhaler carbon reduction across the NENC

REFERENCES

[1] Watts, N., Amann, M., et al. (2019) The 2019 report of The Lancet Countdown on health and climate change: ensuring that the health of a child born today is not defined by a changing climate. https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(19)32596-6/fulltext Accessed 21/1/20.

[2] NHSE. NHS Long Term Plan. https://www.longtermplan.nhs.uk/ Accessed 21/1/20.

[3] NHS SDU. Goods and services carbon hotspots. https://www.sduhealth.org.uk/policy-strategy/reporting/natural-resource-footprint-2018/carbonhotspots.aspx Accessed 21/2/2020.

[4] SDU (2018) Reducing the use of natural resources in health and social care. https://www.sduhealth.org.uk/policy-strategy/reporting/naturalresource-footprint-2018.aspx Accessed 21/1/20.

[5] Centre for Sustainable Healthcare (CSH) Networks. Inhalers and NHS Long Term Plan. https://networks.sustainablehealthcare.org.uk/networks/sustainable-respiratory-care/inhalers-and-nhs-long-term-plan Accessed 21/1/20.

[6] SDU. Tackling the environmental impact of inhalers. https://www.sduhealth.org.uk/news/688/tackling-the-environmental-impact-of-inhalers/ Accessed 21/1/20.

[7] Wilkinson, A.J.K., Braggins, R., Steinbach, I., Smith, J. (2019) Costs of switching to low global warming potential inhalers. An economic and crabon footprint analysis of NHS prescription data in England. https://bmjopen.bmj.com/content/9/10/e028763 Accessed 21/1/20.

[8] Janson, C., Henderson, R., Löfdahl, M., Hedberg, M., Sharma, R., Wilkinson, A.j.K. (2020) Carbon footprint impact of the choice of inhalers for asthma and COPD. Thorax 75 p82-84.

[9] Hänsel, M., Bambach, T., Wachtel, H. (2019) Reduced environmental impact of the Reusable Respimat® Soft Mist™ Inhaler Compared with Pressurised Metered-Dose Inhalers. Advances in Therapy. 36 p2487-2492.

[10] Panigone, S., Sandri, F., Ferri, R., Volpato, A., Nudo, E., Nicolini, G. (2020) Environmental impact of inhalers for respiratory diseases: decreasing the carbon footprint while preserving patient-tailored treatment. BMJ Open Respiratory Research. 7:e000571

[11] RDTC (2020) Inhaler Carbon Impact Assessment tool. www.rdtc.nhs.uk Accessed 14/12/2020.

[12] Jeswani, H. K., Azapagic, A. (2019) Environmental impacts of healthcare and pharmaceutical products: influence of product design and consumer behaviour. Journal of Cleaner Production. 253. 119860.

[13] Dipper, A., Anning, L., Zorzi, A., Thrush, L., Schulz, T., Higbee, D., Nalwaya, P., Maidwell-Smith, A., Pepperell, J. (2018) Reducing plastic waste, carbon footprint and cost: Inhaler recycling at Musgrove Park Hospital. European Respiratory Journal. 52 Suppl. 62, PA3158.

[14] RDTC (2020) Prescribing for Population Health. No. 2 January 2020. North East and North Cumbria. Inhaler Carbon Footprint; Significance, Focus & Action www.rdtc.nhs.uk Accessed 18/06/2021.

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