Economic and Environmental Impacts of a Voluntary Shift in Inhaler Prescribing in the English NHS

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BACKGROUND AND OBJECTIVES

Hydrofluoroalkane (HFA) propellants used in metered dose inhalers (MDIs) constitute approximately 3.1% of the NHS' carbon footprint, at 0.85Mt carbon dioxide equivalent (CO_2e) emissions per year [1]. This is higher than the total annual CO_2e emissions of the 35 smallest nations in the world [2]. Lower greenhouse gas (GHG) alternatives, dry powder inhalers (DPIs), are available but currently only around 30% of inhalers prescribed are DPIs [3]. We estimated the likely cost impact and GHG savings associated with an elective shift in inhaler use from MDIs to DPIs in the English NHS. This analysis builds on previously published work [4].

Figure 1: Examples of MDI (left) and DPI (right)

***Source**: www.NHS.uk*

METHODS

We considered two hypothetical scenarios in which a proportion of inhaler users voluntarily swap from their currently prescribed MDI to a DPI, as well as a sub-analysis in which users of a specific MDI swap to a lower GHG MDI:

- Scenario 1: X% MDI users swap to lowest cost pharmaceutically equivalent DPI. E.g. 1% MDI users swap to the cheapest DPI of equivalent strength within the same drug class.
- Scenario 2: X% MDI users swap proportionally to a pharmaceutically equivalent DPI according to the current market share of each DPI. E.g. If 50% DPI users are prescribed DPI A and 50% DPI B, of the 1% current MDI users choosing to swap, 50% swap to DPI A and 50% to DPI B.
- Scenario 3 (sub-analysis): X% users of the Ventolin Evohaler users (a widely prescribed salbutamol MDI) swap to a lower propellant volume of generic salbutamol MDI.

The analysis included all people >5 years in England prescribed an inhaler, using data from the Prescription Cost Analysis [5]. We considered all currently available MDIs and DPIs delivering five classes of drug: short-acting beta agonists (SABA), long-acting beta agonists (LABA), inhaled corticosteroids (ICS), fixed dose combinations of ICS/LABA, and fixed dose combinations of ICS/LABA/LAMA. We assumed a reduction in the use of spacers (devices that increase the ease of administering MDIs) of half the reduction in MDIs because spacers are often used by young children who may not be eligible to swap inhalers.

The analysis incorporated a cost for re-training MDI users in DPI technique. This was calculated using estimates of the additional NHS staff time required (primarily nursing staff, with some GP and pharmacist time also included). We also determined costs associated with wastage (i.e. doses remaining in inhalers when they are recycled) because evidence suggests that more medication is wasted with MDIs than DPIs (mean wastage: 48% vs 28%) [6].

We calculated an estimate of CO_2e emissions per actuation for each class of MDI based on the average weight of HFA propellant per inhaler and the propellant's 100-year global warming potential. Carbon impact of MDIs included the footprint of propellant content only, therefore, the carbon impact for DPI's was not included.

Table 1: Results of scenarios 1 and 2

Scenario 1: shift to lowest cost DPIs	Δ annual CO_2e emissions (kt)	Δ costs in first year	Δ costs in subsequent years*
1% users swap	-7.19	£1.02m	-£1.32m
2% users swap	-14.38	£2.03m	-£2.65m
28% users swap†	-201.29	£28.42m	-£37.06m
Scenario 2: shift proportionally to DPIs	**Δ annual CO_2e emissions (kt)**	**Δ costs in first year**	**Δ costs in subsequent years***
1% users swap	-7.19	£2.22m	-£0.12m
2% users swap	-14.38	£4.44m	-£0.24m
28% users swap†	-201.29	£62.10m	-£3.38m

* Note that these values do not include discounting to account for the net present value of future costs.
† In a patient survey [6] , 28% inhaler users ranked carbon footprint as 'very important' when choosing an inhaler.

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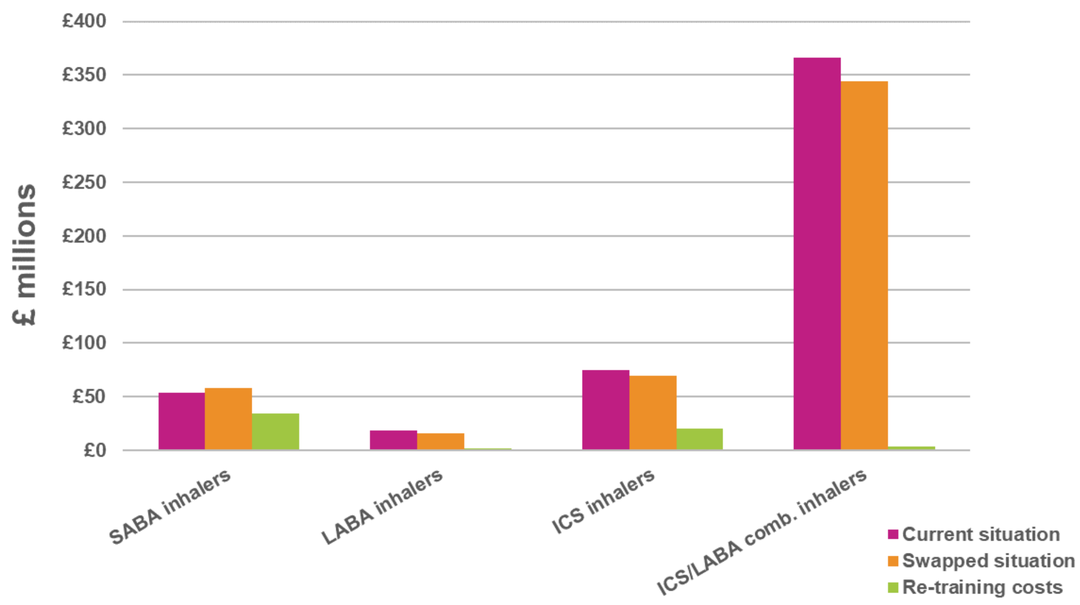
RESULTS

An elective shift in prescribing from MDIs to DPIs would result in lower GHG emissions due to the reduction in HFA propellants released into the atmosphere. The shift would likely be cost incurring in the first year because of the upfront costs of re-training users in DPI technique, but cost saving in subsequent years (Table 1). Therefore, we estimate that overall savings will be generated in the second or third year after people swap to DPIs, depending on the nature of swapping. These savings result from reductions in costs of LABA, ICS and combination inhalers (but not SABA inhalers), as well as spacers (Figure 2). A large proportion of the cost and GHG savings is attributable to a reduction in wasted doses with DPIs.

Figure 2: Cost breakdown for first year (28% of MDI users with asthma swap to lowest cost DPI, Scenario 1)



Sub-analysis: For any proportion of people swapping, a shift from use of Ventolin Evohaler to a generic salbutamol MDI is estimated to be approximately cost neutral and GHG saving. This is because the generic MDI is similar in cost (no re-training costs are incurred) and contains less propellant. However, the GHG savings are not as high as in the other two swapping scenarios (~75% less). For example, the estimated GHG saving for a 28% swap from Ventolin Evohaler to a generic MDI is 34.7kt, compared with 201.3kt for a swap to DPIs.

CONCLUSIONS

- A shift in prescribing from MDIs to DPIs results in substantial GHG savings and could reduce costs within two to three years once re-training costs have been recovered.
- Savings could be achieved at lower costs if changes in short-acting bronchodilator inhalers are focussed on a cost neutral swap from Ventolin Evohaler to generic salbutamol and any swapping from MDIs to DPIs is focussed in other classes of drug.
- Extra time and money spent re-training users in inhaler technique could bring about additional health benefits because baseline inhaler technique and training is generally accepted to be poor in the current situation. In addition, it is possible that re-training costs have been overstated in this analysis because some current users will already be familiar with DPI technique (e.g. because they use an MDI and DPI concurrently).
- A well-designed study to monitor health impacts of swapping inhalers should accompany any initiative that promotes a voluntary shift to DPIs.

REFERENCES

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