

## How to Reduce the Carbon Footprint of Inhaler Prescribing? A Guide for GPs and Practice Nurses in the UK

*This guide is written for health professionals. If you are a user of inhalers, please discuss with your doctor or nurse before making any changes to your treatment.*

Inhalers account for 3-4% of the whole NHS carbon footprint.(1) Metered dose inhalers (MDIs) use hydrofluoroalkanes (HFA) propellants which are potent greenhouse gases, 1000 – 3000 times more potent than carbon dioxide. In the UK approximately 70% of inhalers used are MDIs which is much higher than many other European countries.(2)

### Key recommendations:

To reduce the carbon footprint of inhaler prescribing we recommend that health professionals:

1. Optimize asthma and COPD care
2. Use dry powder inhalers or soft mist inhalers as first choice when clinically appropriate
3. If metered dose inhalers are needed then choose brand and regime with care to minimize carbon footprint
4. Ask patients to return all used inhalers to pharmacies for disposal

### 1. Optimize Asthma and COPD care.

Our first priority must be to identify those with poor control and optimize their care. The clinical and environmental harms of poor disease control will likely outweigh any benefits from use of different inhalers.

A key factor to consider is that the UK has high levels of short-acting bronchodilators (SABA) use, predominantly Salbutamol MDI, which indicates poor disease control.(3) To reduce SABA overuse, effective preventer therapy via a suitable device is required. Effective asthma treatment should aim to reduce the need for SABA use to less than 3 times a week or 2 salbutamol inhalers a year. The lack of dose counters on SABA MDIs may be causing problems for some patients.

MDIs are clinically far more effective with spacers, than without, but patients commonly do not use these. Offering alternative inhaler devices may be particularly useful for those using MDIs without spacers. Alterations to inhaler devices and treatment regimes are an opportunity to improve disease control but always need to be done carefully in discussion with individual patients. Inhalers should be prescribed by brand name.

It is beyond the scope of this guide to fully describe clinical management of asthma and COPD. We recommend using national and international guidance for this. (4,5,6)

## **2. Use dry powder inhalers or soft mist inhalers as first choice when clinically appropriate**

Prescribers face two key questions:

### **a) Would a dry powder inhaler (DPI) or soft mist inhaler (SMI) be clinically appropriate here?**

For the many patients, the answer will be yes. However, a MDI with spacer or breath actuated inhaler (BAI) should be used:

- where a patient is unlikely to have sufficient inspiratory flow, for example in younger children or the very elderly. The British National Formulary can give information on which inhalers may be appropriate for different age children.
- for reliever inhalers where there is concern about severe exacerbations with an acute inability to use a DPI. In this situation a Salbutamol MDI with spacer should be given for use in these situations,
- if following a personalized review of inhaler options, a patient cannot or does not want to use a DPI or SMI,
- where a patient is already using an MDI/BAI with effective technique, has good disease control, and the risks of changing inhalers are thought to outweigh the benefits.

### **b) Which DPI or SMI inhaler to prescribe?**

Inhalers should always be selected in discussion with individual patients (or parents/guardians). The [NICE Patient Decision Aid](#) may be useful for this. Local prescribing guidance and formularies vary across the country and costs for different brands vary with time. It is recommended that the tables below are used to identify options and then a selection is made informed by local guidance. For patients using multiple inhalers it is best to try to use the same type of device where possible. Cost comparisons between inhalers are not straight forward due to indirect savings from more effective care, for example from an easier to use device or using a device with a dose counter. Cost increases from SABA DPIs may be outweighed by cost savings from preventer inhalers.

## **3. If a MDI is needed then chose brand and dosing regime with care to minimize carbon footprint by:**

### **a) Avoiding using branded Ventolin Evohaler**

Ventolin Evohaler has more than double the carbon footprint of other Salbutamol MDIs. Other brands of Salbutamol MDI are therefore preferable unless there are exceptional circumstances which mean these aren't appropriate. This does not affect Ventolin Accuhaler which is a DPI.

### **b) Prescribing inhaled corticosteroids to minimize the number of puffs required for the same dose**

For example prescribe 1 puff of 200mcg Clenil twice a day rather than 2 puffs of 100mcg Clenil twice a day. This can effectively halve the carbon footprint of treatment.

**c) Avoiding using Flutiform or Symbicort MDIs**

These contain HFA227ea which has a much higher carbon footprint than the HFA137a used in other MDIs. These inhalers should only be used for patients where either all alternative inhalers have been tried AND they are recommended by respiratory specialists OR they are already in use and it is thought clinically inappropriate to switch, for example in a patient with known severe or hard to control asthma. This does not apply to Symbicort Turbohaler which is a DPI.

**4. Ask patients to return all used inhalers to pharmacies for disposal.**

The pharmacy can then send for recycling or incineration. They should not be put into household waste as this allows release of remaining HFAs into the atmosphere. Incineration thermally degrades HFAs into far less potent greenhouse gases. Some pharmacies may have access to inhaler recycling which allows the plastics and gases to be recycled.

**Frequently Asked Questions:**

**1. How can I effectively advise on appropriate technique for use of so many different devices which I am not familiar with?**

[Asthma UK videos on inhaler technique](#) can help with this. You will probably find there are relatively few types of device which you prescribe regularly informed by what is recommended in your area.

**2. How do I know which doses of inhalers are likely to be similar in clinical effectiveness?**

The attached table is based on the BTS/SIGN Asthma Guidance. Remember that clinical effectiveness also depends on patient use so finding the right device for a patient is very important.

**3. Do I need to check inspiratory flow in all patients when starting a DPI? And how do I do this?**

No. For many patients there is no need to check their inspiratory flow. Adults and older children with mild to moderate asthma are likely to have sufficient flow. It may be useful having an inspiratory flow device (which is a similar size to a peak flow meter) so that you can check this in those with more severe disease or older patients. Assessing patients' technique with placebo devices, some of which include whistles, can also be useful when starting inhalers.

**4. Is there any benefit to prescribing inhaled corticosteroid MDIs as 2 puffs twice a day rather than 1 puff twice a day of a higher dose?**

Clinically there may be an advantage in terms of flexibility of dosing. However once a patient's dose is stable there is no reason they cannot use a one puff twice a day regime. Some inhalers are priced so that the double strength inhaler is more than double the price of the lower dose inhaler so there may be a cost argument for using a more frequent regime. However using a one puff twice a day regime may be preferable for the patient as each inhaler will last twice as long, if same number of doses per inhaler.

**5. Is there any way to ensure Ventolin Evohaler is not prescribed when prescribing a generic Salbutamol MDI?**

No. There remains debate about whether to prescribe Salbutamol MDI generically or by brand. To ensure Ventolin Evohaler is not given you need to prescribe a specific alternative Salbutamol MDI such as Salamol or Airomir. However, prescribing generically allows pharmacies greater flexibility and so reduces the risk of stock shortages.

**6. My local Clinical Commissioning Group/Health Board recommends MDIs first line. What should I do?**

Many local NHS organisations have amended their prescribing guidance in recent years and others are looking at this. If possible, engage with the CCG and support them in this process. As a prescriber the responsibility for what you prescribe ultimately sits with you so you should only prescribe what you think is appropriate as a professional.

**7. Aren't there many different aspects of inhaler choice, not just environmental, which I should consider?**

Yes. Foremost among these is which is the best inhaler clinically for the patient in question. Carbon footprint is another important but often overlooked impact which is why it is the focus of this guide. Patient preference and financial costs are also important considerations. There are other environmental and social impacts from healthcare and the pharmaceutical industry but for inhalers these are currently poorly described and therefore difficult to take into account.

**8. What about addressing smoking, air pollution, and other causes of lung disease?**

Preventing respiratory disease is very important but beyond the scope of this guide.

**9. Is Maintenance and Reliever Therapy (MART) a good option for some patients?**

Yes. This can improve clinical outcomes and lower environmental footprint for some patients. Some combination inhalers, containing corticosteroid and long-acting beta agonist, can be used as both preventer and reliever inhaler so called Maintenance and Reliever Therapy (MART). As four out of five of the licensed options for MART in the UK are DPIs and this regime reduces the use of salbutamol MDI it can significantly lower the carbon footprint of treatment.

**10. Should emergency packs containing a Salbutamol MDI and spacer be offered to patients who normally have a DPI reliever (MART or SABA)?**

This is one proposed solution to concerns that in an acute asthma attack a patient may not be able to use a dry powder reliever inhaler. This may be particularly useful for those with a history of acute asthma or who are thought to be at high risk of acute asthma. It is important a spacer is available and used.

<b>Inhaled Corticosteroid (ICS) Inhalers by Adult Dose and Carbon Footprint</b>				
	<b>ICS</b>	<b>Low Dose</b>	<b>Medium Dose</b>	<b>High Dose #</b>
<b>Low Carbon Footprint (&lt;1kg CO<sub>2</sub>e per inhaler)</b> Use where clinically appropriate	<b>Beclometasone</b>			
	Beclomethasone Easyhaler	200mcg one puff twice a day	200mcg two puff twice a day	n/a
	<b>Budesonide</b>			
	Budesonide Easyhaler	200mcg one puff twice a day	400mcg one puffs twice a day*	400mcg two puffs twice a day
	Pulmicort Turbohaler	200mcg one puff twice a day*	400mcg one puff twice a day*	400mcg two puffs twice a day
	Budelin Novolizer	200mcg one puff twice a day	400mcg one puff twice a day	400mcg two puffs twice a day
	<b>Fluticasone propionate</b>			
	Flixotide Accuhaler	100mcg one puff twice a day	250mcg one puff twice a day	500mcg one puff twice a day
	<b>Mometasone</b>			
	Asmanex Twisthaler	200mcg one puff twice a day	400mcg one puff twice a day	n/a
<b>High Carbon Footprint (10-20kgCO<sub>2</sub>e per inhaler)</b> Use if low carbon footprint alternative not appropriate	<b>Beclometasone</b>			
	Clenil Modulite pMDI	200mcg one puff twice a day*	200mcg two puffs twice a day	250mcg two-to four puffs twice a day
	Kelhale pMDI (extrafine)	100mcg one puff twice a day*	100mcg two puffs twice a day	100mcg four puffs twice a day
	Qvar pMDI / Autohaler / Easi-Breathe (all extrafine)	100mcg one puff twice a day*	100mcg two puffs twice a day	100mcg four puffs twice a day
	Soprobec pMDI	200mcg one puff twice a day*	200mcg two puffs twice a day	250mcg two or four puffs twice a day
	<b>Ciclesonide</b>			
	Alvesco pMDI	160mcg one puff once a day*	160mcg two puffs once a day	160mcg two puffs twice a day
	<b>Fluticasone propionate</b>			
	Flixotide Evohaler	50mcg two puffs twice a day	250mcg one puff twice a day*	250mcg two puffs twice a day
# Only use after referring the patient to specialist care. * Alternative regimes exist consisting of more puffs of lower strength per day. For paediatric dosing please refer to the BNF.				

## ICS/LABA Combination Inhalers by Adult ICS Dose and Carbon Footprint

	ICS/LABA	Low Dose	Medium Dose	High Dose #
<b>Low Carbon Footprint</b> (<1kg CO <sub>2</sub> e per inhaler) Use where clinically appropriate	<b>Beclometasone dipropionate (extrafine) with formoterol</b>			
	Fostair Nexthaler	100/6 one puff twice a day	200/6 one puff twice a day*	200/6 two puffs twice a day
	<b>Budesonide with formoterol</b>			
	Duoresp Spiromax Fobumix Easyhaler	160/4.5 one puff twice a day	320/9 one puff twice a day*	320/9 two puffs twice a day
	Symbicort Turbohaler	200/6 one puff twice a day	400/12 one puff twice a day*	400/12 two puffs twice a day
	<b>Fluticasone propionate with salmeterol</b>			
	Seretide Accuhaler	100/50 one puff twice a day	250/50 one puff twice a day	500/50 one puff twice a day
	Fusacomb Easyhaler	n/a	250/50 one puff twice a day	500/50 one puff twice a day
	Aerivio Spiromax AirFluSal Forspiro Stalpex Orbicel	n/a	n/a	500/50 one puff twice a day
	<b>Fluticasone furoate with vilanterol</b>			
Relvar Ellipta	n/a	92/22 one puff once a day	184/22 one puff once a day	
<b>High Carbon Footprint</b> (10-20kgCO <sub>2</sub> e per inhaler) Use if low carbon footprint alternative not appropriate	<b>Beclometasone dipropionate (extrafine) with formoterol</b>			
	Fostair pMDI	100/6 one puff twice a day	200/6 one puff twice a day *	200/6 two puffs twice a day
	<b>Fluticasone propionate with salmeterol</b>			
Combisal pMDI; Seretide Evohaler; (Other MDI brands exist)	50/25 two puffs twice a day	125/50 two puffs twice a day	250/25 two puffs twice a day	
<b>Highest Carbon Footprint</b> (>35kgCO <sub>2</sub> e per inhaler) Avoid unless no appropriate alternative or switching is inappropriate clinically	Flutiform MDI	50/5 two puffs twice a day	125/5 two puffs twice a day	250/10 two puffs twice a day
	Flutiform K-haler	50/5 two puffs twice a day	125/5 two puffs twice a day	250/10 two puffs twice a day
	Symbicort MDI	200/6 one puff twice a day	200/6 two puff twice a day	n/a
# Only use after referring the patient to specialist care. * Alternative regimes exist consisting of more puffs of lower strength per day. For paediatric dosing please refer to the BNF.				

### Non-ICS Inhalers by Carbon Footprint

	<b>Short Acting Beta Agonists (SABA)</b>	<b>Long Acting Beta Agonists (LABA)</b>	<b>Short Acting Muscarinic Antagonists (SAMA)</b>	<b>Triple combination (ICS/LABA/LAMA)</b>
<b>Low Carbon Footprint (&lt;1kg CO<sub>2</sub>e per inhaler)</b> Use where clinically appropriate	<b>Salbutamol:</b> Salbutamol Easyhaler Salbulin Novolizer Ventolin Accuhaler  <b>Terbutaline:</b> Bricanyl Turbohaler	<b>Formoterol:</b> Foradil (DPI) Formoterol Easyhaler (DPI) Oxis Turbohaler (DPI)  <b>Indacaterol:</b> Onbrez Breezhaler (DPI)  <b>Olodaterol:</b> Striverdi Respimat (SMI)  <b>Salmeterol:</b> Serevent Accuhaler (DPI)	n/a	<b>Fluticasone Furoate / Umeclidinium / Vilanterol:</b> Trelegy Ellipta (DPI)
<b>High Carbon Footprint (10-20kgCO<sub>2</sub>e per inhaler)</b> Use if low carbon footprint alternative not appropriate	<b>Salbutamol:</b> Aiomir AirSal Salamol  Aiomir 100 Autohaler (BAI) Salamol 100 Easi-breathe (BAI)	<b>Formoterol:</b> Atimos Modulite (MDI)  <b>Salmeterol:</b> Serevent Evohaler (MDI)  Multiple other manufacturers (MDI)	<b>Ipratropium</b> Atrovent MDI	<b>Beclometasone / Glycopyrronium / Formoterol:</b> Trimbow (MDI)
<b>Higher Carbon Footprint (28KgCO<sub>2</sub>e)</b>	<b>Salbutamol:</b> Ventolin 100 Evohaler 100mcg			
All Long Acting Muscarinic Antagonists (LAMA) and LAMA/LABA inhalers have low carbon footprint (DPI or SMI)				

## References

1. Sustainable Development Unit. Reducing the use of natural resources in health and social care [Internet]. NHS England, Public Health England, editors. 2018. Available from: <https://www.sduhealth.org.uk/policy-strategy/reporting/natural-resource-footprint-2018.aspx>
2. Lavorini F, Corrigan CJ, Barnes PJ, Dekhuijzen PRN, Levy ML, Pedersen S, et al. Retail sales of inhalation devices in European countries: So much for a global policy. *Respir Med* [Internet]. 2011;105(7):1099–103. Available from: <http://www.sciencedirect.com/science/article/pii/S0954611111001004>
3. Janson C, Menzies-Gow A, Nan C, Nuevo J, Papi A, Quint JK, et al. SABINA: An Overview of Short-Acting  $\beta$ 2-Agonist Use in Asthma in European Countries. *Adv Ther* [Internet]. 2020 Mar 1 [cited 2021 Jan 17];37(3):1124–35. Available from: <https://doi.org/10.6084/>
4. Chalmers JD, Laska IF, Franssen FME, Janssens W, Pavord I, Rigau D, et al. Withdrawal of inhaled corticosteroids in COPD: a European Respiratory Society guideline. *Eur Respir J* [Internet]. 2020 Jun;55(6):2000351. Available from: <http://erj.ersjournals.com/lookup/doi/10.1183/13993003.00351-2020>
5. National Institute for Health and Care Excellence. NG115 Chronic obstructive pulmonary disease in over 16s: diagnosis and management. 2019; Available from: <https://www.nice.org.uk/guidance/ng115>
6. BTS/SIGN British Guidance on the Management of Asthma 2019 Edition. 2019; Available from: <https://www.brit-thoracic.org.uk/quality-improvement/guidelines/asthma/>

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