**How to Reduce the Carbon Footprint of Inhaler Prescribing?**

**A Guide for Health Professionals in the UK (Version 2)**

*This guide is written for health professionals. If you are a user of inhalers, please discuss with your doctor, nurse, or pharmacist, 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, 1300 – 3350 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:

1. Optimize asthma and COPD care

2. Aim to use dry powder inhalers or soft mist inhalers as first choice when clinically appropriate

3. If metered dose inhalers are needed then chose brand and regime with care to minimize carbon footprint

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

To safely and effectively change inhalers:

1. Share decision making with patients, placing their views centrally
2. Focus on finding the right treatment for the individual
3. Do not undertake blanket switching if changing device type or medication. These changes should be made in discussion with each individual.\*
4. Teach and review inhaler technique at every opportunity.

How to optimize care is discussed further below.

\* It may be appropriate to undertake blanket switching of groups of patients if the medication and the device type are remaining the same, for example between brands of Salbutamol MDI.

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. Annual reviews are an important opportunity to optimize care for every patient with asthma or COPD. Presentation with exacerbations, prescription requests or clinical audits all contribute to identifying patients who have poor control and would benefit from changes to improve their care.

A key factor in optimizing asthma care is ensuring correct inhaler technique and reliever therapy are used, avoiding overreliance of short-acting bronchodilators (SABA) which can indicate poor disease control. The UK has high levels of SABA use, predominantly Salbutamol MDI.(3) To reduce SABA overuse in asthma, effective preventer therapy via a suitable device is required. Regular inhaled treatment in asthma should be with inhaled corticosteroids and regular inhaled treatment in COPD should normally be with long-acting bronchodilators. 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 [PCRS asthma slide rule](https://www.pcrs-uk.org/resource/asthma-slide-rule) tool can help work out number of inhalers used. The lack of dose counters on SABA MDIs may be causing problems for some patients. Many MDIs are discarded before they are empty and patients may be unsure how many doses their inhalers contain.

MDIs can be far more effective with spacers, than without, but patients commonly do not use them. Patients of all ages who need or prefer MDIs should be encouraged to use them, especially for regular preventer treatments. 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. When it is safe and possible to do so, face to face assessment should be prioritised to allow assessment of inhaler technique. Where this is not possible, video consultation is preferable to telephone, as this allows better assessment of inhaler device use. If considering switching devices, placebos can be very useful to practice device use and handling. Some placebo devices (e.g. Turbohaler patient trainer whistle, Ellipta Inhalation Trainer, MDI Trainhaler) whistle if the patient uses the correct inspiratory flow. This may be particularly useful during video consultations.

Some patients may become over-reliant on reliever inhalers which bring short-term symptom relief, but don’t target underlying airway inflammation. Carefully explaining that the aim is reduce the need for the reliever by getting the disease under better control may help. Patients should also be reassured that whilst the aim is to improve disease control whilst reducing environmental impact, if disease control worsens due to changing inhalers then they can switch back again. 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)

1. **Aim to use dry powder inhalers or soft mist inhalers as first choice when clinically appropriate**

Prescribers face two key questions:

1. **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 be able to take a fast deep breath in with 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.

1. **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](https://www.nice.org.uk/guidance/ng80/resources/inhalers-for-asthma-patient-decision-aid-pdf-6727144573) 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.

1. **If a MDI is needed then chose brand and dosing regime with care to minimize carbon footprint by:**
2. **Avoiding use of 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.

1. **Prescribing inhaled corticosteroids to minimize the number of puffs required for the same dose**

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

1. **Avoiding use of 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.

1. **Ask patients to return all used inhalers to pharmacies or dispensaries for disposal.**

The pharmacy or dispensary 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 or dispensaries 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](https://www.asthma.org.uk/advice/inhaler-videos/) 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.

1. **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.

1. **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. Assessing patients’ technique with placebo devices, some of which include whistles, can also be useful when starting inhalers (see Optimizing care section above). 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.

1. **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.

1. **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.

1. **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.

1. **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. Supply issues may be important in some areas at some times. 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.

1. **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.

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

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.

1. **Should emergency packs containing a Salbutamol MDI and spacer be offered to patients with asthma or COPD whose normal treatment is DPI/SMI?**

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 attacks or who are thought to be at high risk of an attack. It is important a spacer is available, and the patient has been carefully trained in how to use MDI and spacer for this purpose and in the need to call for help if such treatment is necessary.

1. **Will new propellant gases for MDIs with lower carbon footprint make the changes suggested in this guide unnecessary?**

Metered dose inhalers using the propellant HFA152a are being developed and are expected to have a significantly lower carbon footprint than currently available MDIs. They are likely to be a valuable option for patients requiring MDIs in the future but it is not clear when these will be available for patients and it is not expected that their carbon footprint will be as low as currently available dry powder inhalers. It is therefore not recommended that treatment changes are delayed in anticipation of this development.

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| **Inhaled Corticosteroid (ICS) Inhalers by Adult Dose and Carbon Footprint** | | | | |
|  | **ICS** | Low Dose | Medium Dose | High Dose # |
| **Low Carbon Footprint**  **(<1kg CO2e per inhaler)**  Use where clinically appropriate | **Beclometasone** | | | |
| Beclomethasone Easyhaler | 200mcg one puff twice a day | 200mcg two puff twice a day | n/a |
| **Budesonide** | | | |
| 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 |
| **Fluticasone proprionate** | | | |
| Flixotide Accuhaler | 100mcg one puff twice a day | 250mcg one puff twice a day | 500mcg one puff twice a day |
| **Mometasone** | | | |
| Asmanex Twisthaler | 200mcg one puff twice a day | 400mcg one puff twice a day | n/a |
| **High Carbon Footprint**  **(10-20kgCO2e per inhaler)**  Use if low carbon footprint alternative not appropriate | **Beclometasone** | | | |
| 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 |
| **Ciclesonide** | | | |
| Alvesco pMDI | 160mcg one puff once a day\* | 160mcg two puffs once a day | 160mcg two puffs twice a day |
| **Fluticasone proprionate** | | | |
| 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.  All doses listed are licensed for adult asthma.  For COPD and paediatric asthma please check licensing and dosing in the British National Formulary. | | | | |

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| **ICS/LABA Combination Inhalers by Adult ICS Dose and Carbon Footprint** | | | | |
|  | **ICS/LABA** | Low Dose | Medium Dose | High Dose # |
| **Low Carbon Footprint**  **(<1kg CO2e per inhaler)**  Use where clinically appropriate | **Beclometasone diproprionate (extrafine) with formoterol** | | | |
| Fostair Nexthaler | 100/6 one puff twice a day | 200/6 one puff twice a day\* | 200/6 two puffs twice a day |
| **Budesonide with formoterol** | | | |
| 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 |
| **Fluticasone proprionate with salmeterol** | | | |
| 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 |
| **Fluticasone furoate with vilanterol** | | | |
| Relvar Ellipta | n/a | 92/22 one puff once a day | 184/22 one puff once a day |
| **High Carbon Footprint**  **(10-20kgCO2e per inhaler)**  Use if low carbon footprint alternative not appropriate | **Beclometasone diproprionate (extrafine) with formoterol** | | | |
| Fostair pMDI | 100/6 one puff twice a day | 200/6 one puff twice a day \* | 200/6 two puffs twice a day |
| **Fluticasone proprionate with salmeterol** | | | |
| 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 |
| **Highest Carbon Footprint (>35kgCO2e per inhaler)**  Avoid unless no appropriate alternative or switching is inappropriate clinically | **Fluticasone proprionate with formoterol** | | | |
| 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 |
| **Budesonide with formoterol** | | | |
| 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.  All doses listed are licensed for adult asthma.  For COPD and paediatric asthma please check licensing and dosing in the British National Formulary. | | | | |

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| **Other Inhalers by Carbon Footprint** | | | |
|  | ***Short Acting Beta Agonists (SABA)*** | ***Long Acting Beta Agonists (LABA)*** | ***Triple combination (ICS/LABA/LAMA)*** |
| **Low Carbon Footprint**  **(<1kg CO2e per inhaler)**  Use where clinically appropriate | **Salbutamol:**  Salbutamol Easyhaler  Salbulin Novolizer  Ventolin Accuhaler  **Terbutaline:**  Bricanyl Turbohaler | **Formoterol:**  Foradil (DPI)  Formoterol Easyhaler (DPI)  Oxis Turbohaler (DPI)  **Indacaterol:**  Onbrez Breezhaler (DPI)  **Olodaterol:**  Striverdi Respimat (SMI)  **Salmeterol:**  Serevent Accuhaler (DPI) | **Fluticasone Furoate / Umeclidinium / Vilanterol:**  Trelegy Ellipta (DPI) |
| **High Carbon Footprint**  **(10-20kgCO2e per inhaler)**  Use if low carbon footprint alternative not appropriate | **Salbutamol:**  Airomir  AirSal  Salamol  Airomir 100 Autohaler (BAI)  Salamol 100 Easi-breathe (BAI) | **Formoterol:**  Atimos Modulite (MDI)  **Salmeterol:**  Serevent Evohaler (MDI)  Multiple other manufacturers (MDI) | **Beclometasone / Glycopyrronium / Formoterol:**  Trimbow (MDI) |
| **Higher Carbon Footprint (28KgC02e)** | **Salbutamol:**  Ventolin 100 Evohaler |  |  |
| All Long Acting Muscarinic Antagonists (LAMA) have low carbon footprint (DPI or SMI).  All LAMA/LABA inhalers have low carbon footprint (DPI or SMI).  Short Acting Muscarinic Antagonist (SAMA) is only available as Ipratropium which has a high carbon footprint (Atrovent MDI)  Cromoglicate and Nedocromil inhalers are only available as inhalers with high carbon footprints. (Intal MDI and Tilade MDI).  For indications, dosing and licensing please check the British National Formulary. | | | |

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**Note: Specific branded inhalers are referred to in this guide in order to help health professionals identify which devices are likely to have higher or lower carbon footprint so they can consider this when making treatment decisions with patients. We are not endorsing any specific products or suggesting clinical superiority of any particular products relative to others. We ask that this guide is not to be used by the pharmaceutical industry in marketing their products.**