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European Respiratory Society position statement on asthma and the environment

"For the generation of my children, Europe is a unique aspiration. It is an aspiration of living in a natural and healthy continent.

"I am convinced that the old growth model based on fossil fuels and pollution is out of date and out of touch with our planet."

- Ursula von der Leyen, President of the European Commission (European Commission, 2019)

Section 1: Introduction

Aim

This statement outlines how climate change and air pollution currently affect patients with asthma and how the ambitious European Union Green Deal can provide solutions. It also considers the complex interplay between asthma inhalers, the respiratory patient and climate change, highlighting the example of the review of F-gases legislation in the EU. In addition, it presents how the European Respiratory Society addresses the topic of asthma and the environment, and while the primary emphasis to tackle climate change and air pollution must always be on regulatory action and legislative change, we introduce the concept of the "green asthma patient", which we define as a patient who is facilitated in making conscious choices to reduce their carbon footprint without compromising health outcomes.

Who we are

The European Respiratory Society (ERS) is an international organisation that brings together physicians, healthcare professionals, epidemiologists, patient representatives, scientists and other experts working in respiratory medicine. We are one of the leading medical organisations in the respiratory field, with a growing membership representing over 160 countries. Our mission is to promote lung health and alleviate suffering from disease, and drive standards for respiratory medicine globally. Science, education and advocacy are at the core of everything we do. This position statement has been developed and led by the

ERS Advocacy Council and the ERS Environment and Health Committee, with cross-disciplinary speciality input from ERS Assembly 5 (Airway Diseases, Asthma, COPD and Chronic Cough), Assembly 6 (Epidemiology and Environment), Assembly 7 (Paediatrics) and the European Lung Foundation.

What is asthma?

Asthma is a non-communicable disease of global importance. It is a chronic disease of the air passages of the lungs, which inflames and narrows them [a] (GINA, 2018). Asthma is a complex disease with a mix of genetic and environmental factors contributing to its development. It is an all-too prevalent chronic disease that is estimated to affect as many as 339 million people worldwide. Its prevalence is increasing in many countries, especially among children. Although some countries have seen a decline in hospitalisations and deaths from asthma, it still imposes an unacceptable burden on healthcare systems, and on society through loss of productivity in the workplace. Asthma is the most common chronic disease of school-aged children. (GINA, 2018) (GINA, 2020) and it results in missed school days, hospitalisations and disruption to the family (Fletcher, Green and Neidell, 2010) (Khreis et al., 2017). And there are substantial long term impacts of childhood asthma on general health status and obesity in adults.

How does air pollution and climate change affect asthma?

Burning fossil fuels produces carbon pollution that drives climate change and creates air pollution, such as particulate matter. Particulate matter comprises tiny air particles that can reach far into the lungs and enter the bloodstream causing harm to health. Long-term exposure to air pollution can significantly increase the risk of asthma, especially in young children (Khreis et al., 2017). Breathing polluted air can also cause asthma attacks in people who already have asthma (Thurston et al., 2016).

Younger children are more vulnerable to air pollution and climate change than adults because their lungs and immune systems are still developing. They also breathe at a faster rate, spend more time outdoors, and are more physically active than adults; all of these factors increase their exposure to air pollutants that can damage the lungs. Young children may be exposed to even higher levels of pollution if they live in cities, or near major roads or busy streets. As much as 13% of global asthma incidence in children may be attributable to traffic-related air pollution (Global Strategy for Asthma Management and Prevention, 2020).

[a] The Global Initiative for Asthma (GINA) describes Asthma as "a heterogeneous disease, usually characterised by chronic airway inflammation. It is defined by the history of respiratory symptoms such as wheeze, shortness of breath, chest tightness and cough that vary over time and in intensity, together with variable expiratory airflow limitation".

Children living in these areas have increased risks of developing asthma or exacerbating existing asthma. Indoor pollution, such as from cigarette smoke, wood burning for heating, cooking with gas, candle use, dust or mould, can also trigger asthma attacks. Furthermore, we know that legislation to reduce pollution and clean up the atmosphere results in improved lung growth in children (Gauderman et al., 2015).

Epidemiological data supports the link between exposure to low-levels of ambient air pollution during pregnancy and early life, and asthma development and impaired lung function growth in later life (Khreis et al., 2017).

The foetus is also vulnerable to the mother breathing pollutants. For example, increased household benzene and nitrogen dioxide in the second trimester has been found to be directly related to impaired spirometry at school age (Morales et al., 2014). Furthermore, exposure to outdoor air pollution is implicated in leading to reduced birth weight (Smith et al., 2017) (Pedersen et al., 2013), which is itself associated with long-term impairment of lung function. Given that it is known that lung function tracks from early in life, with no catch-up growth, the protection of the foetus and infant must be of the highest priority.

Increase in temperature and more extreme temperature and weather variations will have impact on asthma patient. Temperature variations have a direct impact on risk of hospitalization for asthma (Wu et al., 2021). In addition, the higher temperatures that come with climate change promote more ground-level ozone pollution. Ozone is a powerful lung irritant and can trigger asthma attacks. As the climate warms, pollen-producing plants release pollen for longer periods of time each year; many allergenic plants also produce more pollen when they are grown in air that has more carbon dioxide. As a result, climate change may make the pollen season worse for people with allergic asthma. Extreme weather events, hotter temperatures and drought are contributing to more frequent and intense wildfires, thunderstorms, and sandstorms, which can lead to pollution, causing asthma (D'Amato et al., 2015) (Rorie and Poole, 2021) (Sohail et al., 2020).

What will the European Green Deal do for Asthma?

On 11 December 2019, coinciding with the UN's COP 25 climate summit in Madrid, the European Commission launched a major climate package, the European Green Deal. The initiative is a roadmap to achieve the EU's aim to be climate neutral by 2050: that is, to have net-zero greenhouse gas emissions by 2050, which is enshrined in a "Climate Law". As part of this, there is a binding EU target of a net domestic reduction of at least 55% in greenhouse gas emissions by 2030 compared to 1990.

The European Commission plans to review every EU law and regulation in order to align them with the new climate goals and this is accompanied by an action plan to boost the

efficient use of resources by moving to a clean, circular economy and reducing pollution. This may be done *via* measures to tackle climate change, such as updating legislation on transport emissions (*e.g.* from cars and vans), or *via* updated air quality legislation aligned with the WHO air quality guidelines. The Green Deal will have a positive impact on asthma in a range of areas. Ultimately, mitigating climate change and reducing air pollution *via* the Deal will reduce morbidity and mortality from asthma.

What does the ERS advocate on the European Green Deal?

As part of the European Green Deal, the European Commission is committed to revising the EU Ambient Air Quality Directives to more closely align them with WHO guidelines and the latest scientific evidence on air pollution. The Commission is considering including into the Directives an explicit mechanism for adjusting air quality standards in response to technical and scientific progress, or including air pollutants that are were previously not covered; this is welcomed and supported by the ERS. Scientific progress is constant and dynamic. Environmental epidemiologists and others are continually updating the evidence on the health effects of air pollution. An explicit mechanism in the legislation to take this into account would radically improve the effectiveness of the legislation and consequently lead to better health outcomes for everyone, particularly asthma patients.

An important part of the European Green Deal is phasing out the use of fossil fuels. Any strategy aimed at phasing out fossil fuels should include action to reduce both emissions (combustion efficiency) and fuel use (fuel efficiency). The latter also has major benefits for the environment by reducing the impact of deforestation from unregulated felling of trees for fuel, which contributes to soil erosion and the loss of an important natural source of CO_2 sequestration.

Ensuring energy efficiency in homes is another crucial action that mitigates greenhouse gas emissions while yielding benefits for both the environment and health, as it helps to curb emissions. However, proper ventilation, and regulation of indoor air pollution sources (reduction of wood burning for heating) must also be ensured to reduce indoor pollution and the triggering of asthma. On top of the specific Green deal actions, governments and local authorities should adopt a range of additional measures such as the locating schools and green spaces away from major roads and planting the least allergenic trees and plants in urban areas.

In the context of the European Green Deal, the legislation on fluorinated greenhouse gases plays an important role. While it phases out devices that have harmful emissions, thus benefiting the environment, it must be ensured that it does not put patients in danger by unintentionally removing essential asthma devices. Patient safety, efficacy and choice must

remain the primary drivers in deciding the most suitable medical device for respiratory patients (see section 3).

For the European Green Deal to have the maximum positive impact on asthma, the ERS would like to see the most ambitious Zero Pollution Action Plan for Water, Air and Soil. To maximise health benefits, it is important to implement measures that would reduce peak exposures in specific hotspots, as well as reduce the average exposure of all EU citizens. While asthma patients will greatly benefit from improved air quality, the Action Plan when covering the circular economy should also consider supporting the establishment of national inhaler recycling schemes and encouraging more environmentally friendly packaging of medicines and medical devices to reduce plastic pollution and environmental pollution from pharmaceuticals.

To tackle climate change and support the European Green Deal, the ERS is taking a number of actions. Numerous ERS members are involved in the development and supporting the implementation of the World Health Organization air quality guidelines. Following up on the first WHO Conference on Air Quality and Health (World Health Organisation, 2018), the ERS and the European Lung Foundation initiated a combined action on air quality. To date, more than 50 medical societies and patient organisations have pledged to raise awareness of the issue and make reduction of air pollution a priority for all.

Furthermore, the ERS has dedicated structures on environment and health. One of them is ERS Assembly 6 on epidemiology and environment, which is involved in many activities to promote public awareness and scientific research in the field. Its work is also supported by ERS Assembly 5 on airway diseases, asthma, COPD and chronic cough. In addition to this, the ERS Advocacy Council has a standing committee on environment and health that provides the information needed to improve the management of environmental factors related to respiratory diseases, with an aim to prevent lung disease and contribute to the improvement of respiratory health in Europe and elsewhere by the provision of information to policy-making agents, clinicians, scientists and the public. We have also set up a MEP Lung Health Group in the European Parliament, which is an informal platform for policymakers, health professionals and patients to identify the potential EU policy measures aimed at improving lung health such as clean air policies and action on climate change.

As one of the leading medical organisations in the respiratory field, the ERS hosts an annual international congress, which is the largest respiratory meeting in the world. On the one hand the congress is dedicated to breakthroughs in the prevention, treatment and care of asthma, and on the other hand the ERS strives to reduce the environmental impact of the congress and is committed to hosting greener congresses in the future. We also promote clean air *via* the Healthy Lungs for Life campaign.

Section 2: Environment

Air pollution is increasingly recognised as an important risk factor for asthma, affecting both the risk of new-onset asthma and deterioration in asthma patients with established disease. From a mechanistic perspective, air pollutants cause oxidative injury to the airways, leading to inflammation, remodelling and increased risk of sensitisation. Air pollution presents a burden to asthma throughout the life course, from the prenatal period and early childhood, where asthma is the most prevalent chronic disease, to old age, where accumulation of air pollution exposure over many years can cause new-onset asthma (Guarnieri and Balmes, 2014). The most solid evidence exists on the effects of air pollution exposure in exacerbating disease in asthma patients. Here, short-term exposure to high, peak concentrations of air pollution over several minutes or hours (in a traffic commute, for example), or days (air pollution "episodes" of extreme high concentrations in a large city, for example) can trigger asthma attacks, both in terms of milder symptoms, such as wheezing, or more severe attacks that can require use of asthma medication, emergency room visits, hospitalisation, or even death (Host et al., 2018).

A recent coroner's ruling in a landmark case in London, UK, recognising that air pollution was a cause in the death of Ella Kissi-Debrah, a 6-year-old severe asthma patient, has major significance in recognising the severe health consequences of air pollution. The ruling stated that Ella Kissi-Debrah's death in February 2013 was caused by acute respiratory failure, severe asthma and air pollution exposure to traffic-related nitrogen dioxide (NO_2) and particulate matter pollution around her home, which were in excess of WHO guidelines (World Health Organisation, 2016). The ruling also stated that the failure to reduce pollution levels to legal limits possibly contributed to Ella's death, as well as the failure to provide her mother with information about the potential for air pollution to exacerbate asthma. This is the first ruling of its kind, in the UK and globally, that has referred to air pollution a public health emergency, and which will likely play a role in increasing pressure on governments to tackle unlawful levels of air pollution (Courts and Tribunal Judiciary, 2021).

Apart from the clear role of air pollution triggering attacks in asthma patients, the role of long-term air pollution exposure in the development of new-onset asthma has been the subject of debate. However, recent meta-analyses summarising findings from 41 studies clearly showed that long-term exposure to NO_2, particulate matter with diameter <2.5 and <10 µm ($PM_{2.5}$ and PM_{10}), and black carbon can cause new-onset asthma in children (Khreis et al., 2019) (Khreis et al., 2017). Furthermore, a subsequent global burden of disease study found that 4 million, or 13% of new paediatric asthma cases globally, can be attributed to NO_2, and that a majority (92%) of cases occurred at levels below the current WHO recommended level of 40 µg/m^3 (Achakulwisut, Brauer, Hystad and Anenberg, 2019). Although fewer studies have been conducted in adults, a recent expert report by the

American Thoracic Society, based on the latest evidence and biological mechanistic understanding, concludes that air pollution is a plausible contributor to the onset of asthma (and COPD) (Thurston et al., 2020). In the 13 published epidemiological studies, all show consistently that long-term exposure to both NO_2 and $PM_{2.5}$ can lead to new-onset asthma in adults, even at levels well below current WHO recommendations (Liu et al., 2021).

Everyday life activities, such as the burning of fossil fuels like coal and oil, increase the amount of carbon dioxide emitted into the Earth's atmosphere, thus changing its natural composition (World Health Organisation, 2018). Climate change will impact human and planetary health in a number of ways including deteriorating environment, air and water quality; spreading of vector-borne diseases and allergens; increasing the frequency and intensity of extreme weather, such as heat waves, droughts, floods, and wildfires; and disrupting supply of water and food, among others.

One of the main concerns for asthma patients is worsening air quality as a result of climate change. Increasing temperatures and warmer air in urban areas help form ground-level ozone, a powerful lung irritant and trigger of asthma attacks. Increasing frequency of extreme heat and droughts increase the frequency of wildfires, which produce massive air pollution concentrations and exposures to local communities, and can be transported by the wind for thousands of miles. Increasing droughts and extreme windstorms also contribute to more frequent sand and dust storms, which are major sources of pollution in Northern Africa, the Middle East and parts of the Mediterranean.

Increasing frequency of extreme heat will also affect asthma patients adversely, as breathing hot air can aggravate airways and trigger asthma symptoms (Haines and Ebi, 2019). Furthermore, dehydration and a related increase in breathing rate may be a cause of asthma symptoms and attacks. Increasing temperatures in areas with humid air also pose challenges to asthma patients, as hot and humid air is "heavy" and harder to breathe. In addition, moist air traps lung irritants such as pollen, mould and indoor dust mites, all of which can aggravate asthma. Individuals who have allergic asthma are also at a greater risk of allergy symptoms as a result of climate change. The warmer weather will contribute to longer pollen (and other aeroallergens) seasons, as well as spreading some allergens to new areas as climate changes. Furthermore, moisture from increased rainfall and floods can increase the risk of mould indoors, which is a major asthma irritant.

Many of the root causes of climate change also increase the risk of pandemics. Deforestation for agricultural purposes is the largest cause of unprecedented habitat and biodiversity loss worldwide. Loss of habitat forces animals to migrate and potentially come into contact with other animals or people and transmit disease. Large livestock farms can also serve as a source for spillover of infections from animals to people. The ongoing COVID-19 pandemic has

triggered new awareness about the links between fossil fuel-based economy, climate change, deterioration of natural biodiversity, emergence of new infections, and planetary and human health, with the respiratory patient at its epicentre. Air pollution is likely linked to increased COVID-19 severity and mortality, by compromising the immune system response and through its impact on chronic cardiorespiratory and metabolic diseases, including asthma (European Parliament, 2020).This interaction between air pollution and COVID-19 poses even greater concerns for asthma patients, and provides additional arguments for air pollution policies and climate change actions needing to go hand in hand to ensure better lung health in the post-pandemic era.

Section 3: Therapy – inhalers

In respiratory practice there are five classes of inhaler devices used in treating patients: pressurised metered dose inhalers (pMDIs), dry powder inhalers (DPIs), soft mist inhalers, spacers and nebulisers. There is concern that pMDIs, which contain hydrofluorocarbon (HFC) propellants, contribute to global warming.

In context, medical aerosols contribute <0.1% of F-gas emissions (Intergovernmental Panel on Climate Change, 2014) (OzonAction). Importantly, refrigeration, air conditioning and heat pumps contribute 86% of the total F-gas output, and we would support a higher visibility of authorities to mandate restrictions in these areas. In an attempt to reduce F-gas HFC propellant usage from inhaler devices, some authorities have suggested the switching of stable respiratory patients from a pMDI to a DPI. This is concerning. As clinicians, our duty of care is to the patient first. Patient safety, efficacy and choice must remain the primary drivers in deciding the most suitable medical device for respiratory patients (Usmani, Scullion and Keeley, 2019).

Choice is critical

Many of the disciplines within clinical medicine have in the past decade focussed their attention towards precision medicine initiatives that have directed the community to focus on personalising treatment individualised to the patient. We believe that restricting adults' and children's access to pMDIs will be a retrograde step for the respiratory medical community and respiratory practice in modern times, especially for pre-school children, for whom there may be no viable alternative. Importantly, the GINA directive has highlighted the importance of the inhaler device with a section on strategies for effective use of inhaler devices, which states "choose the most appropriate device for the individual patient and treatment" (GINA, 2020).

Data show that inhaler devices should not be considered interchangeable with regard to their pharmaceutical performance (Thomas and Williams, 2005). Each of the five classes of device has a different way in which the patient inhales from the device. Switching of patients from one inhaler type to another is not a simple process. Decisions about the choice of the inhaler device should be made on an individual clinical basis between healthcare professionals and patients.

Patient safety and efficacy

We are concerned that limiting the ability of healthcare professionals to use the right inhaler for the right patient will risk deterioration in patient care. Specifically, in the emergency respiratory situation, patients must use a pMDI and spacer device as patients struggle to generate sufficient inspiratory inhalation flows from DPIs for optimal delivery of the drug to the lungs, and hence therapeutic benefit (Pritchard, 2020).

Any proposed legislation should be put into perspective for our patients, and this has been highlighted in the media (Washington Post, 2019). Many respiratory patients have reported feeling angry at their disease or their right to medication being compared to a lifestyle choice; we must be cognisant of this inappropriate messaging to our patients and not to allow them to be made to feel guilty or ostracised about using a particular inhaler device, such as a pMDI.

Asthma treatment is adjusted in a continuous cycle of assessment, treatment - and review of the patient's response in terms of both symptom control and future risk (of attacks and side-effects). For population-level decisions about asthma treatment, the preferred option at each step represents the best treatment for most patients, based on group mean data for efficacy, effectiveness and safety from randomised controlled trials, meta-analyses and observational studies, and net cost. The patient's preferences and practical issues (*e.g.* inhaler technique, adherence and cost to the patient) together with the patient's goals, beliefs and concerns about asthma and their medications are critically important; that is:

- Technique - can the patient use the inhaler correctly?
- Adherence – how often is the patient likely to take the medication?
- Cost – can the patient afford the medication?

The WHO Essential Medicine 2017 list for asthma medications include pMDI "reliever" and pMDI "preventer" inhaler medications. Globally, 97% of all reliever inhalers are pMDIs and they are much cheaper than DPIs. A wholesale switch of pMDI reliever medications, notably short-acting beta-agonists (SABAs), would lead to significant increases in the cost of these life-saving medications.

Recycling and inhaler life cycle

We are unaware of government-supported national inhaler recycling schemes, which we believe must happen if governments are serious in supporting appropriate inhaler use. We also encourage inhaler manufacturers to reassess the packaging related to their inhaler devices and use alternatives to plastic packaging. The circular economy announced as part of the EU's Green Deal will be important in this regard.

While improving our climate and skies above, we must not pollute our oceans below. DPIs are plastics that have a greater effect compared to pMDI propellant on fossil depletion, terrestrial acidification and freshwater eutrophication (Jeswani and Azapagic, 2019). We must have policy coherence and need to consider the whole life cycle and wider environment, including plastic levels in all medical devices.

Inhaler innovation

We have a choice in using low GWP propellants (HFA 134a *versus* HFA 228 a) in current pMDI inhaler devices and this message should be encouraged. We also have the option of non-propellant based devices such as soft mist inhalers. We advocate the promotion of the use of correct terminology. We believe the right language must be used in any directive or document that does not support a particular pharmaceutical product, and support the term "low (or zero) global warming potential" inhaler/medical aerosol as the preferred language. Important for the review is that inhalers with low or zero global warming potential are already available or are being developed. We believe any directive should allow time to develop new propellants, and not stifle current innovation, where inhaler manufacturers are undertaking research and development: potential clinical products with new lower or zero GWP inhaler propellants will be available in 5 years (Chiesi, 2019). Innovation and progress for our patients and society is essential. Reliever SABA pMDIs , and not just preventer pMDIs, must benefit from new propellant innovation, where poor asthma control drives increased reliever SABA use which have a significant emissions burden.

Opportunity to educate and train

The current debate on the climate with respect to inhalers has allowed a very important opportunity: the opportunity to educate all healthcare professionals, patients, policymakers and governments on inhaler devices. The ERS has created a video that highlights key considerations on inhaler devices (ERS, 2018). We have also produced a document on what the pulmonary physician should know about inhaler devices (Laube et al., 2011). We need to ensure healthcare professionals are trained in the correct use and demonstration of use in the five key classes of inhaler device and advocate undergraduate and postgraduate

teaching on inhaler knowledge and competency in the curricula of medical, nursing, pharmacy and physiotherapy schools. The inhaler technique of the patient should be checked regularly. At all times, we should be doing the right thing clinically for our patients with asthma and this should underlie our primary focus. The following table on reducing the environmental impact of inhalers in respiratory care is adapted from Keeley et al (Keeley, Scullion and Usmani, 2020).

Multi-faceted approach is needed

We all must work collectively to reduce the overall global warming potential (GWP) contribution of asthma treatments and a multifaceted approach, rather than simply focusing on the inhaler device, is needed.

Asthma places a large physical, mental, emotional, social and economic burden on patients. We should assess all patients in order to confirm the diagnosis of asthma, and to identify and manage factors that may be contributing to symptoms, poor quality of life, or attacks. In many cases, asthma may appear to be difficult to treat because of modifiable factors such as incorrect inhaler technique, poor adherence, smoking or comorbidities, or because the diagnosis is incorrect.

We need to:

- achieve an accurate diagnosis of asthma in the patient to avoid unnecessary inhaler treatments.
- provide better education for healthcare professionals in the diagnosis and management of asthma.
- give better education to patients in optimising inhaler technique and use, including spacer use.
- promote patient adherence to preventer medication to improve asthma control and decrease reliance on pMDI SABA reliever inhalers.
- support patients with self-care, including personal asthma action plans.
- establish national countrywide inhaler device recycling schemes.
- provide an opportunity for industry in the development of alternative low or zero GWP propellants, develop reusable inhalers for use by patients, and better manufacturing re-utilisation of inhaler components returning to the inhaler cycle.
- ensure that patients change from one device to another in order to minimise the propellant per dose only when it is clinically appropriate, where it is safe and that it is acceptable to the patient.

What to do	How to do it
Improve asthma diagnosis, asthma control and reduce use of SABA reliever inhalers	• Encourage regular preventer treatment • Empowering patients by helping them understand their condition and how their treatments work • Ensure healthcare professionals understand the dose ranges and relative potencies of inhaled corticosteroids • Address smoking cessation, exercise promotion, flu immunisation
Promote effective self-management	• Written personal action plans for patients
Educate healthcare professionals on inhalers	• Teach about inhalers in undergraduate and postgraduate training programmes in medicine, nursing, pharmacy and physiotherapy schools • Include questions about inhaler technique in examinations for healthcare professionals • Ask healthcare professionals to demonstrate inhaler use in practical examinations
Ensure inhalers are used with correct technique for greater effectiveness	• Know how to teach this and do it • Encourage use of online video tutorials for patients
Consider use of spacers to increase clinical effectiveness of pMDIs	• Consider spacers to aid inhalation with pMDIs; this increases lung deposition and reduces oral deposition of drug • Spacers are important for children younger than 7-8 years of age
Prescribe pMDIs with minimal propellant quantity and consider alternative inhaler brands	• For example: Salamol inhaler contains half as much propellant as Ventolin inhaler for equivalent dosage, and beclometasone 200 µg one puff twice daily uses half as much propellant as beclometasone 100 µg two puffs twice daily
Ensure patients have a pMDI and spacer emergency treatment pack for self-management of exacerbations, especially if using DPIs for regular treatment	• Provide emergency treatment packs with clear simple pictorial instructions for their use
Promote inhaler recycling	• Encourage government to support pharmacies to develop and promote the use of inhaler recycling schemes and reduce the waste of plastic, metal and propellant

Section 4: The green asthma patient

The risks to respiratory patients from pollution and greenhouse gas emissions are increasingly recognised by patients and professionals. Yet information to patients and the public about the dangers of air pollution still needs to be scaled up and disseminated more widely. For the most-part, people remain unaware of the contribution air pollution caused by health care, including that from F-gas HFC propellant, commonly used in inhaled medications. While the primary emphasis to tackle climate change and air pollution must always be on regulatory action and legislative change (as outlined in section 1). There are some complimentary actions that individuals can take. More and more people living with asthma are becoming green asthma patients: patients who are enabled by green regulations and facilitated to make conscious choices to reduce their carbon footprint without compromising health outcomes. More and more individuals are looking to their everyday lives to be "greener", including their food sources, travel, household products and clothing choices – to name a few. The concept that patients have the "choice" to be green in their healthcare is not something that, as yet, seems to be high on the agenda. However, we can be sure that it is coming. Healthcare has a role to play in tackling climate change and reducing our contribution to global emissions. From a health consumer perspective, the key will be that patients will want options and to have the choice to select the green alternative, if it is right for them, and if it does not negatively impact on their health. Health consumers will increasingly view medications and healthcare use within the "green lifestyle" paradigm and will want the option to choose treatments that both sustain their health in the short term and which do not contribute to long-term environmental pollution. Healthcare choices will become the natural extension to green lifestyle choices, such as choosing sustainable energy to warm the home or choosing a transport option with a lower environmental impact.

In the case of asthma, the argument should not only centre on prescribing the "right" or "wrong" inhaler device. Other clinical considerations are important - such as ensuring the patient has an accurate diagnosis, regular respiratory reviews and are using their inhaler correctly. We should assess the patient's whole lifestyle - greenhouse gas footprint – ask them about whether they recycle, using efficient transport, make sure clinicians are getting the respiratory diagnosis right – in order to undertake appropriate prescribing.

Clinician and healthcare practices should ensure that they too are following "green" steps to make sure that clinic visits by patients have as low impact as possible. Clinicians should also be educated in using high-value non-pharmacological treatments, such as smoking cessation and pulmonary rehabilitation, and also ensure supported self-care with patient-tailored self-management and action plans. At each patient contact opportunity, clinicians should check and optimise the inhaler technique and utilise inhaler training videos. By doing this, we can help ensure that the respiratory healthcare footprint is minimal. One way to

further this is to use available e-health tools and online consultations that could significantly reduce travelling for the patient.

However, we should consider that patients may often be at a disadvantage from having to manage a chronic condition, and any "green" options that also increase costs should be avoided. Living with asthma already has a potentially large physical, mental, emotional and economic burden, and we need to ensure that "green" options are a positive and not an additional burden. Ultimately, the main actions will still need to be taken at a higher level where environmentally unfriendly practices are addressed via legislation and actions by governments.

Finally, patient groups are active in the field of the environment, with many speaking out on behalf of individuals like Ella Kisi-Deborah. They have an important role to play in calling for change by telling their stories of how air pollution has impacted their health.

Section 5: Conclusion

Climate change and air pollution currently affect patients with asthma in multiple, concerning ways. The statement has laid out the complex dilemma around asthma inhalers, the respiratory patient and climate change and concluded that patient care must never be compromised. We have introduced the concept of the "green asthma patient", a patient who is enabled by greener healthcare regulations and who can make conscious choices to reduce their carbon footprint without compromising health outcomes and we argue that this is a concept that will increase in importance.

The primary emphasis to tackle climate change and air pollution must always be on regulatory action and legislative change. Ambitious policies and structural changes are needed in our cities, transportation, industry, agriculture and energy systems to ensure long-term reductions in air pollution and greenhouse gases, and to move away from fossil fuel use. The ambitious European Union Green Deal and other similar policies around the world can provide solutions and cleaner air policies will provide immediate and significant health benefits to asthma patients and contribute to prevention of new asthma cases. Their co-benefits in reducing greenhouse gas emissions and tackling climate change crises make them central to ensuring a more healthy and resilient population, environment and planet.

We need to strive for more.

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