Project Title:

Sustainability of Inhaler Prescribing in Primary Care

Start/End date of Project:

October 2022 – March 2023

Date of Report:

28th March 2023

Background:

Each year, the carbon footprint of inhalers prescribed in Wales is equivalent to a flight to the sun and back. Currently, most of the inhalers prescribed are pressurized metered dose inhalers, which have a high carbon footprint due to the propellant gases they contain.

Short acting beta agonist (SABA) inhalers account for more than half of the inhaler carbon footprint in Wales. Overuse of SABA inhalers is common in the UK and is known to be associated with increased asthma exacerbations and asthma mortality[1]. Reducing the overuse of SABA inhalers through improved patient education and asthma control will improve patient outcomes and reduce carbon footprint.

In addition to this, if inhalers with lower global warming potential (GWP) are prescribed first line where appropriate for the patient, further reduction in carbon emissions can be made. Inhalers with the lowest GWP are dry powder inhalers and soft mist inhalers. NHS Wales is committed to increasing the proportion of low GWP inhalers to 80% of all inhalers prescribed by 2025. If low GWP inhalers are not suitable for a patient, then metered dose inhalers can be switched to a brand containing the smallest volume of propellant gas, Salamol inhalers for example have less than half the carbon footprint of a Ventolin Evohaler.

Switching inhaler devices carries a risk of worsening asthma control if not done in a patient centred way. It is important that all decisions regarding the best device for each patient is individualized. The carbon footprint attributed to worsening asthma control through exacerbations or even hospital admissions would be far greater than the carbon saved through changing to a lower carbon device.

At the end of their useful life, inhalers are often disposed of with domestic waste.
When used pMDIs are disposed of in this way, the residual gases are likely to be released into the atmosphere and contribute to global warming. There is no national recycling scheme available for inhalers in Wales currently so the most environmentally friendly alternative is to dispose of used or unwanted inhalers at a community pharmacy. This way the inhalers will be incinerated at a high temperature and the gases will be degraded into chemicals with a much smaller global warming potential[2].

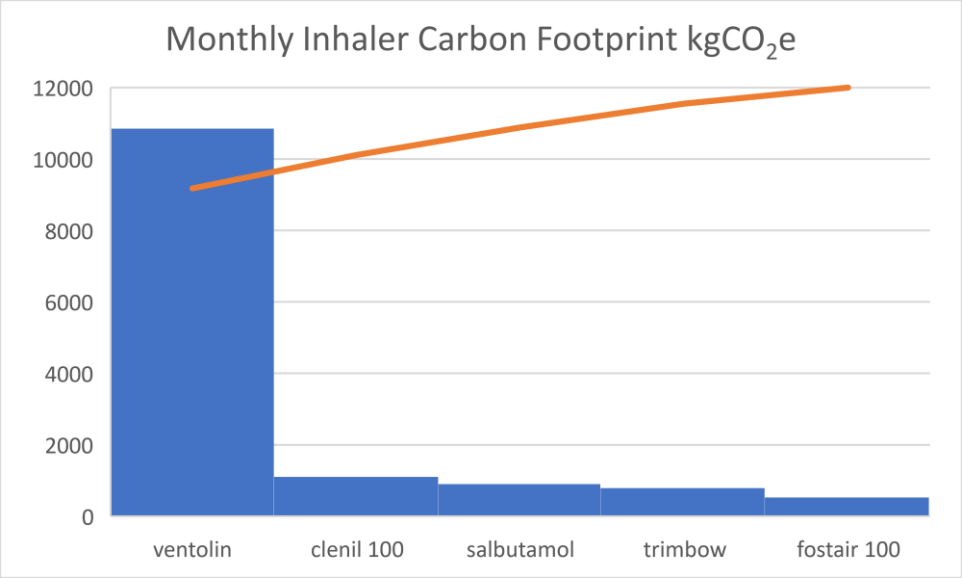
Specific Aims:

To reduce the number of SABA prescribed
To increase the proportion of low GWP inhalers prescribed
To reduce the carbon footprint of inhaler waste

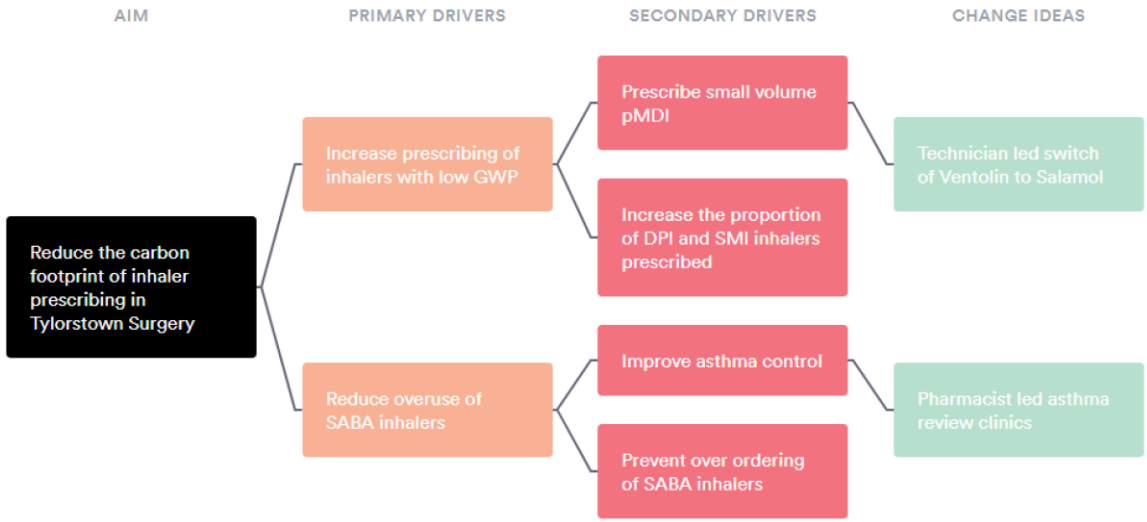
Methods:

This project was piloted in a single practice in a deprived area of Cwm Taf Morgannwg University Health Board (CTMUHB).

Prescribing data was gathered to identify the inhalers with the greatest carbon footprint in the practice. The following pareto chart shows the five inhalers with the greatest carbon footprint contribution:



This shows that Ventolin has by far the greatest contribution to carbon footprint in the practice. For this reason, interventions were focused on prescribing of Ventolin. The following driver diagram was created to identify potential change ideas.



Two change ideas were tested during this project. Firstly, a pharmacist led review clinic was set up to target patients with poor asthma control. Patients were stratified according to the number of SABA inhalers prescribed in the last year as an indicator of potential poor asthma

control, using a digital tool created for this purpose, and patients with concomitant COPD were excluded. More than a quarter of patients on the asthma register were found to be prescribed 12 or more SABA inhalers per year.

Secondly, switching Ventolin prescribed on repeat to lower carbon Salamol was completed by a Health Board Pharmacy Technician. This required engagement of the Community Pharmacist, to ensure sufficient stock available for the change, and the Practice Team, who may need to respond to any queries about the change.

In addition to the above, in collaboration with the Your Medicines Your Health campaign, a pilot was set up to promote the return of used inhalers to a selected community pharmacy for incineration. Marketing materials including posters and paper returns bags were provided.

Measurement:

Patient outcomes:

Number of SABA inhalers prescribed per month to patients on the Asthma register, as a surrogate marker to quantify extent of SABA overuse in patients in the pilot surgery.

Population outcomes:

Not measured.

Environmental sustainability:

Data for the carbon footprint of prescribed inhalers can be calculated manually by searching the prescribing system to give the monthly quantity prescribed for each individual brand of inhaler, and multiplying by its respective indicative carbon footprint. Data for carbon footprint of individual inhalers is available from Presqipp[3]. For example:

Ventolin Evohaler prescriptions in August
364 x 28.262 $kgCO_2e$ = 10,287 $kgCO_2e$

With around 134 different brands of inhaler currently available, this process would be incredibly time consuming, so for the purposes of this project the data for carbon footprint of prescribed inhalers was taken from the Spira Decarbonisation Dashboard[4] (only available in Wales). This dashboard reports on several key metrics at a health board, cluster and GP practice level to inform progress in reducing the carbon footprint of inhalers used within primary care in Wales. There is a 3 month lag in the data reported so the data evaluated for this project will be from September 2022 to February 2023.

For promotion of inhaler returns to community pharmacy, the number of inhalers returned was measured at baseline and in the month after the campaign began.

Economic sustainability:

Data for the monthly cost of prescribed inhalers can be calculated manually by searching the prescribing system to give the monthly quantity prescribed for each individual brand of inhaler, and multiplying by its respective cost as indicated in the Drug Tariff or the BNF. Similarly to calculating the carbon footprint, this process would also be incredibly time consuming, so data was taken from Spira Decarbonisation Dashboard as above.

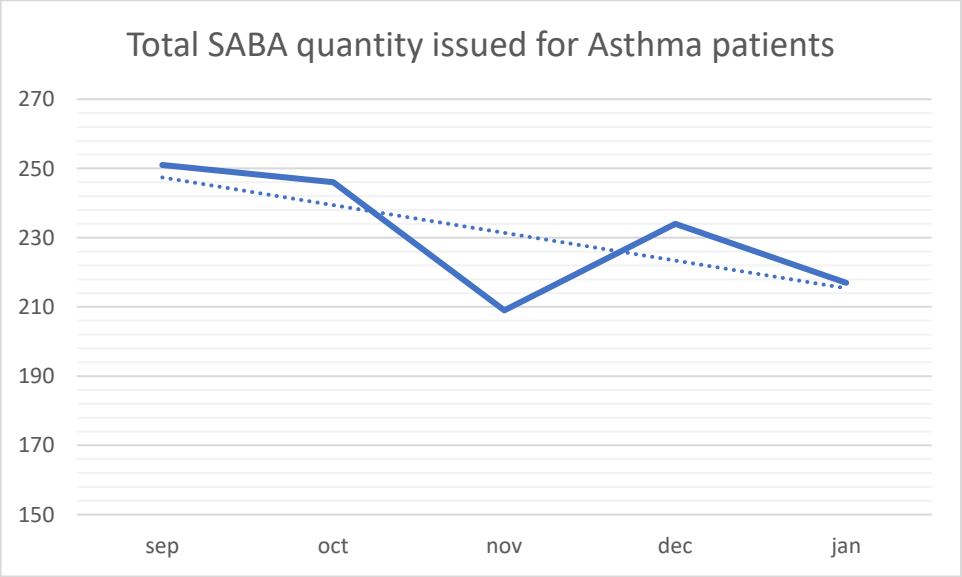
Social sustainability:

Patients with asthma are more likely to be from a younger demographic compared to some other health conditions and attending an asthma review may mean that they have to take time away from work or school to attend. Poor asthma control can impact negatively on work or school attendance, and can also prevent patients from participating in activity such as sport.

Results:

Patient outcomes:

Reduction in SABA overuse as indicated by trend to reduction in monthly number of SABA prescribed for patients on the Asthma register at the pilot surgery from September to January.

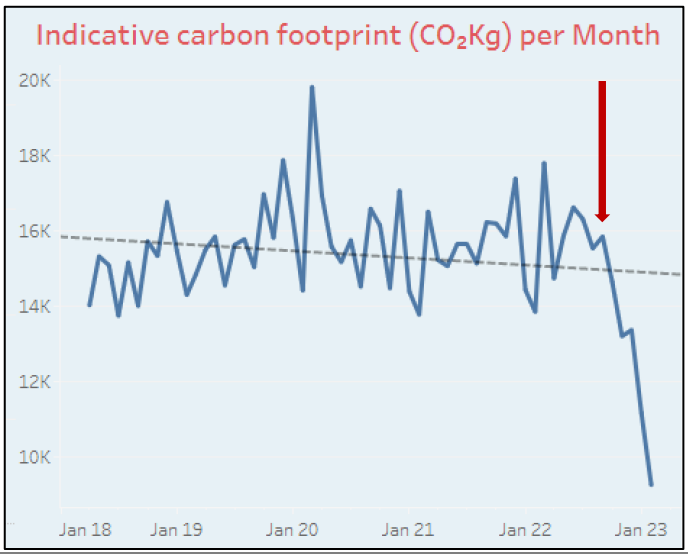


Population outcomes:

No data.

Environmental sustainability:

Reduction in monthly inhaler carbon footprint from 15,831 kgCO_2e in September to 9,252 kgCO_2e in February. The red arrow indicates the start of the project in September.



Change in carbon footprint for each month compared to the previous year is as follows:

	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
$kgCO_2e$ per month Mar 21 - Feb 22	16490	15209	15047	15634	15630	15116	16208	16176	15836	17367	14419	13835
$kgCO_2e$ per month Mar 22 - Feb 23	17777	14719	15846	16602	16293	15515	15831	14635	13190	13355	11153	9252
change from previous year	+1287	-490	+799	+968	+663	+399	**-377**	**-1541**	**-2646**	**-4012**	**-3266**	**-4583**
% change	+8%	-3%	+5%	+6%	+4%	+3%	**-2%**	**-10%**	**-17%**	**-23%**	**-23%**	**-33%**
								Intervention				

Data from after the project started in September is highlighted in red. The total carbon savings for the period September 2022 to February 2023 was 16,425 $kgCO_2e$. Based on the emissions factor of fuel and well to tank emissions for an average sized car with unknown fuel[5], this is equivalent to:

$$16{,}425\ kgCO_2e \div 0.3472\ kgCO_2e/mile = 43{,}307\ miles$$

The average monthly carbon footprint reduction during the intervention period was 2,375.5 $kgCO_2e$ per month. If this reduction is maintained during the following 6 months, the estimated reduction over a period of 12 months would be equivalent to:

$$32{,}850\ kgCO_2e \div 0.3472\ kgCO_2e/mile = 94{,}614\ miles$$

Increase in the number of inhalers returned to the pharmacy from 5 per month to 53 per month over a data collection period of one month. Carbon savings from incineration of pMDI inhalers is estimated to be 3–17 kg per inhaler compared with sending the inhaler to landfill[2]. Using Ventolin as an example of a pMDI and Easyhaler as an example of a DPI, with end of life carbon footprint inhaler data from Prescqipp[6], approximate carbon savings are as follows:

Ventolin landfill: 7.383 kg CO_2e
Ventolin incinerated: 0.02685 $kgCO_2e$ (saving 7.35615 $kgCO_2e$ per inhaler)

Easyhaler landfill: 0.05552 $kgCO_2e$
Easyhaler incinerated: 0.0247 $kgCO_2e$ (saving 0.5305 $kgCO_2e$ per inhaler)

With 28 pMDI and 25 DPI:

$$(28 \times 7.35615\ kgCO_2e) + (25 \times 0.5305\ kgCO_2e) = 219\ kgCO_2e$$

$$219\ kgCO_2e \div 0.3472\ kgCO_2e/mile = 631\ miles$$

Economic sustainability:
Monthly costs for inhalers is increasing, and continued to increase in the pilot practice throughout the project. This is dependent on a number of factors including costs of inhalers for COPD which was not within the remit of this project. However the project did impact positively on cost.

	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
£ cost per month Mar 21 – Feb 22	16817	15930	15009	15871	16593	15445	16188	15640	15387	17748	15469	15262
£ cost per month Mar 22 – Feb 23	19247	16351	17467	17168	18067	18086	18411	17371	17776	18194	16388	16069
£ change from previous year	+2430	+421	+2458	+1297	+1474	+2641	**+2223**	**+1731**	**+2389**	**+446**	**+919**	**+807**
% change	14.4%	2.6%	16.4%	8.2%	8.9%	17.1%	**13.7%**	**11.1%**	**15.5%**	**2.5%**	**5.9%**	**5.3%**
								Intervention				

In the months before the intervention, the average percentage increase in cost was 11.3%, and in the months after the intervention this was reduced to 9.8%. Over a 12 month period this would represent a "saving" of £2898.43.

Whilst a modest impact on cost has been made, more attention must be paid to economic sustainability in order to appreciably offset the rising inhaler spend. This is a learning from the project that will be applied to future work, and highlights the importance of using the most cost-effective inhaler devices first line, reserving other options only when needed to maintain, patient centred care.

Social sustainability:

A significant proportion of patients were not reviewed in the pharmacist led clinics because they either could not be contacted, could not be booked into the clinic, or did not attend their clinic appointment. Data was not collected to identify if any particular groups were affected, but this is something that could be audited in the future that may inform ways to reduce inequality.

Discussion:

This project was able to demonstrate a clear reduction in the carbon footprint of inhalers prescribed by the practice. This was achieved through pharmacist led clinics focused on reducing overuse of SABA inhalers,and switching of SABA inhalers to lower carbon equivalents (Ventolin switched to Salamol).

Patients were selected for review in the pharmacist led clinic using a digital tool developed specifically for this project to stratify them according to risk. With some adjustments this tool can be shared with other practices to enable them to target patients more effectively and efficiently.

Many patients reviewed in the pharmacist led clinic demonstrated an improvement in asthma control and a reduction in reported SABA use, but often these patients continued to request monthly prescriptions for SABA. So improved asthma control did not always translate into a reduction in the number of SABA prescribed. Reasons for this included anxiety about running out of inhalers, inability to tell when the inhaler is empty, and mistrusting the prescription request process.

A reduction in SABA use was only demonstrated when the prescription request process was changed - the patients who had their SABA prescription removed from repeat, or who were switched to maintenance and reliever (MART) therapy eliminating the need for a separate SABA inhaler. Addressing the process for patient requesting SABA prescriptions will be key to making significant inroads to the excess number of SABA prescriptions, but achieving this will be difficult as many practices do not have the administrative capacity.

Through collaboration with the Your Medicines Your Health campaign, patient education and marketing materials proved effective in increasing the number of inhalers returned to community pharmacy for incineration. It was noted by the community pharmacist that progress tailed off when he was not present at the pharmacy. Building on the success of this pilot, the campaign will be extended to other community pharmacies within CTMUHB. To ensure the ongoing progress and learning from the pilot, more attention will be paid to provision of education and resources to the whole pharmacy team to increase engagement. By increasing the number of inhalers that are returned to community pharmacy, this project will ensure that once a recycling pathway becomes available the foundations have been laid to maximise its benefits.

Conclusions:

The interventions made during the project led to a reduction in 16,425 kgCO_2e from the previous year, equivalent to 47,307 miles. If this reduction is maintained then the estimated reduction for the year will be 32,850 kgCO_2e, equivalent to 94,614 miles, a distance greater than the circumference of the earth.

Ventolin inhalers account for a significant proportion of inhalers prescribed in Cwm Taf. Switching these inhalers to the Salamol brand reduces the carbon footprint by half. This intervention has the greatest potential to achieve significant carbon savings in a short period of time. This is essential as the climate crisis has direct impacts on human health that is already evident and disproportionately affect patients with respiratory disease. This switch has already been extended to other practices in Cwm Taf with the ambition to complete across the Health Board.

Pharmacist led clinics targeting the most poorly controlled asthma patients with the highest SABA use were effective in improving asthma control and in reducing the number of SABA inhalers prescribed. However the drivers for SABA overuse are complex and other aspects of the patient journey will also need to be addressed in order to achieve lasting change. Tools and support will be rolled out to other practices in the Health Board in order to build on the success of the project so far.

Patient education is effective in increasing the quantity of inhalers that are returned to community pharmacy to be disposed of in the most environmentally friendly way. There is potential that the infrastructure to recycle inhalers becomes available again in the future and it is most likely that this would be delivered via community pharmacy. This will also be extended to all pharmacies in the Health Board.

References and Resources

1. Royal College of Physicians, Why Asthma Still Kills: The National Review of Asthma Deaths (NRAD), May 2014

2. Wilkinson AJ, Braggins R, Steinbach I, Smith J. Costs of switching to low global warming potential inhalers. An economic and carbon footprint analysis of NHS prescription data in England. BMJ open. 2019 Oct 1;9(10).

3. Presqipp Inhaler Data Tables **Bulletin 295: Inhaler carbon footprint | PrescQIPP C.I.C** [accessed 28/03/23]

4. Spira Decarbonisation Dashboard https://spira.uk/spira_decarb.html [accessed 28/03/23]

5. UK Government GHG Conversion Factors https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2022 [accessed 28/03/2023]

6. Presqipp Bulletin 295: Inhaler carbon footprint | PrescQIPP C.I.C https://www.prescqipp.info/our-resources/bulletins/bulletin-295-inhaler-carbon-footprint/ [accessed 18/04/2023]