



TTSH Earth Day Project Showcase

Project 1: Eye Can Recycle

Project Overview:

'Eye Can Recycle' is a multi-pronged sustainability initiative for Cataract Surgeries at Ang Mo Kio Specialist Centre (AMKSC), in support of Tan Tock Seng Hospital's 2030 target of reducing waste disposed by 30%, in line with GreenGov.SG goals.

Key Stakeholders:

1. Internal: Clinical Ops (Eye), AMKSC Ops
2. External: Plaspulp Union Pte Ltd, ReThink Good, Semula Asia, Ipse Ipsa Ipsum

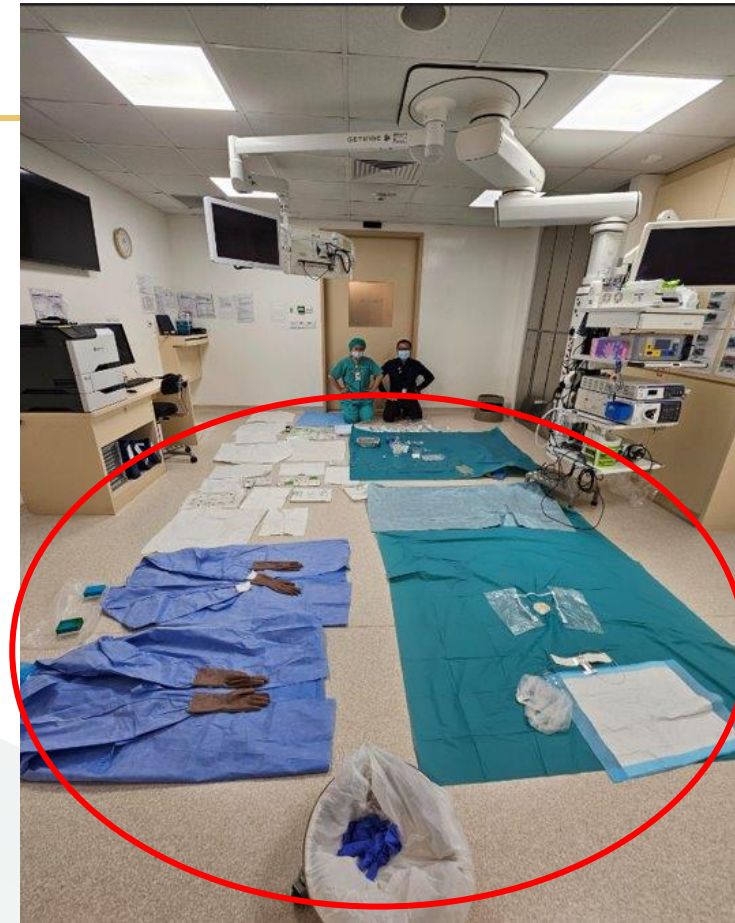
Long-term Vision:

To implement sustainable practices at AMKSC for day surgery and transfer successful models back to the TTSH Eye Department.

The Problem

- A large amount of **thrown-away waste** is generated from the phacoemulsification Cataract Procedure, waste which goes into **incineration & landfill**.
- This is amplified by the fact that cataract surgery is the **most common surgery done** in TTSH with almost **8,000 cases annually** (including 2,400 done in Ang Mo Kio Specialist Centre (AMKSC)).

~ **3kg** of thrown-away waste / procedure



Amount of thrown-away waste generated by 1 phacoemulsification procedure for 1 patient at AMKSC

Solution: Tackling Waste Reduction (How)

1. **Reduce:** Avoiding or Using Less

- Streamlining surgical packs
- Removing unnecessary items
- Optimising drape sizes
- Cutting material usage without compromising safety

Goal: To reduce waste by
30%!

2. **Recycle:** Plastic and Paper Waste

- Collection at AMKSC
- Sent to vendors for processing
- Converted into plastic pellets and recycled paper

3. **Upcycle:** Reimagining Fabric Waste

- Repurposing materials from surgical gowns, drapes and table cover
- Transforming them into new and usable items (i.e. clothes hanger)



Total Waste = 2.94kg/patient

100%

44% Reduction

3. Disposal and landfill

56%

1.637kg/patient



1. Avoid or use lesser

0.327kg/patient

11%



Patient sticky label



Height and Weight chit



Intravenous tray



Nail brushes



Table cover and Drape (reduce size)

2. Collect and recycle

0.35kg/patient

12%



PET Trays



HDPE Tube



HDPE Board



PS Eye Shield



PE Bags



PP Tray



PP Bottle

Plastics

Paper



Paper tray



Paper Sheet



Paper Boxes

0.626kg/patient

21%

Fabric



Surgical gowns



Table cover and Drape



Plastic Pellets



Recycled Paper



Plastic card prototype



Other molded items

Annual Impact – Reduction of thrown-away waste and cost saving

Reduce

| SN | Item | Intervention | Annual weight of thrown-away waste saved | Emission factor (Production + End of life) | Annual reduction of carbon footprint / kgCO2e* | Annual cost saving | Status update |
|----|---|--|--|--|--|--------------------|---|
| 1 | Patient sticky label | Use less | 24kg | 2.772 + 0.296 | 73.632 kgCO2e | \$220.80 | Implemented |
| 2 | Height and weight chit | Eliminate | 1.6kg | 0.405 + 0.296 | 1.1216 kgCO2e | \$16 | Implemented |
| 3 | Intravenous tray | Use less | 130kg | 1.715 + 0.296 | 261.43 kgCO2e | \$456 | Implemented |
| 4 | Nail brushes | Use less | 127kg | 4.260 + 0.296 | 578.612 kgCO2e | \$1,406.25 | In-progress |
| 5 | Drapes and table cover | Use less (reduce size by at least 34%) | 489.6kg | 2.480 + 0.296 | 1,359.13 kgCO2e | To be determined | In-progress (part of Cataract Surgical Pack content review) |
| 6 | Kidney Bowl, 18G Blunt Needle, and Gauze Swab in Cataract Surgical Pack | Use less | To be determined | To be determined | To be determined | To be determined | |
| | | Total | 772.2kg (10.9% of total) | | 2273.93 kgCO2e (Eqv to CO2 absorbed by 93 trees annually) | \$2099.05 | |

Recycle

| SN | Item | Weight of thrown-away waste saved per patient | Annual Weight of thrown-away waste saved | Emission factor | Annual reduction of carbon footprint / kgCO2e* | Annual cost saving | Status update |
|----|--------------------|---|--|-------------------------------------|--|--------------------|---------------|
| 1 | Plastics and paper | 0.35kg | 840kg | To be determined – under evaluation | | | Implemented |
| 2 | Fabric materials | 0.63kg | 1,502.4kg | | | | In-progress |
| | Total | 0.98kg | 2,342.4kg (33.2% of total) | | | | |

Solution: Raise Awareness

1. Education: To Raise Staff Awareness About Sustainability

- Industry partners like ReThink Good and Semula Asia were engaged to conduct a workshop with AMKSC staff, educating them on proper recycling practices and the fostering of good recycling habits.

Results:

- Staff are now actively separating recyclable paper and plastic waste after each procedure and have been actively sharing their expertise on the current recycling and reduction interventions.

How May Others Help (Additional Resources)

By taking proper care of your vision using the following tips, you could help prevent the development of cataracts and reduce the need for surgery:

- Protect your eyes from the sun to prevent UV damage
- Consider regular eye checkups, especially after the age of 40, to detect any early signs of cataracts and other eye conditions.
- Quit smoking and make eye-healthy food choices - rich in antioxidants, particularly vitamins C and E.

Keep mindful that the recycle bins are not for general waste. Do not dispose general waste inside, so as to prevent contamination.

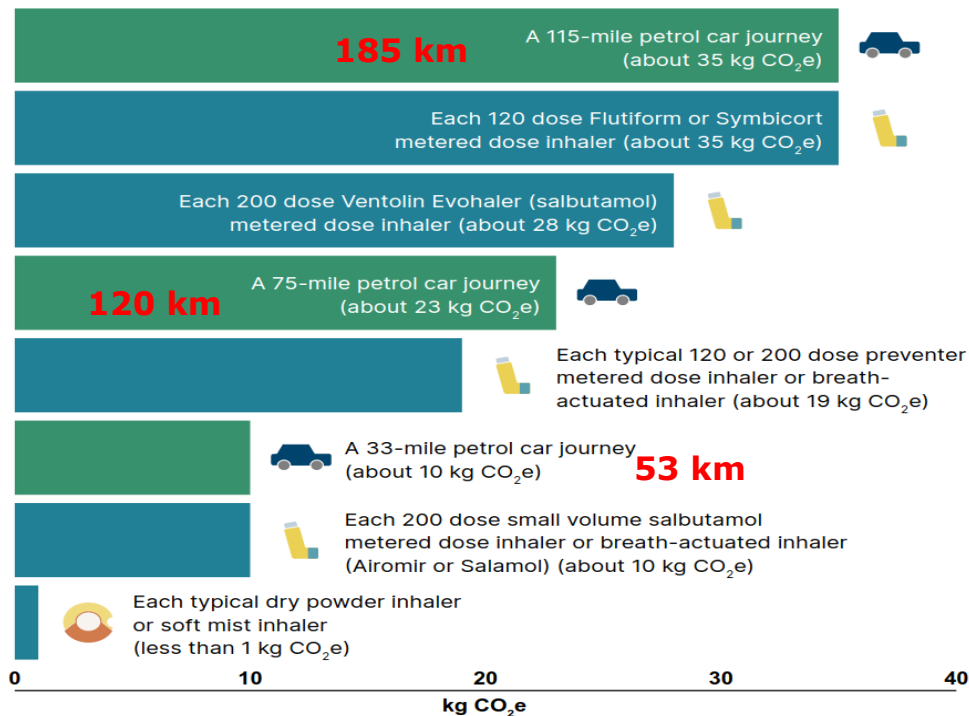
Project 2: Make the Switch, MDIs to DPI/SMIs

Metered Dose Inhalers (MDIs) have been widely used for decades to treat respiratory conditions such as asthma and chronic obstructive pulmonary disease (COPD). However, these devices contain hydrofluorocarbon (HFC) propellants, which are potent greenhouse gases that contribute significantly to global warming. In response TTSH is trying to encourage patients to shift towards more sustainable alternatives such as Dry Powder Inhalers (DPIs) and Soft Mist Inhalers (SMIs), which deliver medication effectively without relying on greenhouse gas propellants.

Why MDIs Are an Issue

- Metered dose inhalers (MDIs) are commonly used to treat asthma and COPD (chronic obstructive pulmonary disease).
- MDIs, however, use hydrofluorocarbons (HFCs) as propellants to deliver medication.
- These hydrofluorocarbon gases are about 1,000 to 3,000 times more potent at trapping heat than the most commonly known greenhouse gas, carbon dioxide.

Why MDIs Are an Issue



Patient Decision Aid from NICE <https://www.nice.org.uk/guidance/ng80/resources/asthma-inhalers-and-climate-change-patient-decision-aid-pdf-6727144573>

Why MDIs Are an Issue

- While alternatives to MDIs are available in the form of Dry Powder Inhalers (DPIs) and Soft Mist Inhalers (SMIs), patient preference for MDIs remains ingrained.
- This leads to an overuse of MDIs, that cumulatively contribute to climate change through usage or leakage of HFCs over time.

Dry Powder Inhalers (DPIs) and Soft Mist Inhalers (SMIs) are environmentally friendly inhalers which do not contain greenhouse gas.

Dry Powder Inhaler (DPI)



Soft Mist Inhaler (SMI)



Metered Dose Inhaler (MDI)



Examples (not comprehensive)

What is TTSH Doing to Address This?

- In collaboration with Laselle College of the Arts, our inhaler poster has been updated to emphasize inhalers that provide better disease control with less environmental impacts.
 - DPIs and SMIs are prominently displayed and labelled with Eco labels to nudge doctors in prescribing more eco-friendly options, where appropriate.
 - MDIs are consequently displayed less prominently to discourage their use.
- Treatment guidelines have also been updated in compliance with International Guidelines to provide better control of asthma and COPD:
 - GINA (asthma) Guidelines – Change from Salbutamol to ICS-Formoterol inhalers for relief
 - GOLD (COPD) Guidelines – ICS-LABA combinations have been removed from GOLD 2023 guidelines. Use combination DPIs or SMI.
- Doctors have been actively prescribing DPIs/SMIs to new patients to discourage adoption of MDIs.

What is TTSH Doing to Address This?



For Medical Professionals Only

Respiratory Inhalers

At A Glance

| SABA | SAMA | SABA/SAMA | LAMA | LAMA/LABA |
|--|---|---|---|---|
| <p>Salbutamol 100mcg MDI¹</p> | <p>Ipratropium 20mcg MDI¹</p> | <p>Berodual MDI¹ (Fenoterol 50mcg, Ipratropium 20mcg)</p> | <p>Spiriva Respimat (SMI)² (Tiotropium 2.5mcg)</p> <p>Incruse Ellipta (DPI)³ (Umeclidinium 62.5mcg)</p> | <p>Spiolto Respimat (SMI)¹ (Tiotropium 2.5mcg, Olodaterol 2.5mcg)</p> <p>Anoro Ellipta (DPI)¹ (Umeclidinium 62.5mcg, Vilanterol 25mcg)</p> <p>Ultibro Breezhaler (DPI)² (Indacaterol 110mcg, Glycopyrronium 50mcg)</p> |
| ICS/LABA | | | | ICS |
| <p>Seretide 25/125 Evohaler (MDI)¹ (Fluticasone 25mcg, Salmeterol 25mcg)</p> | <p>Seretide 25/250 Evohaler (MDI)¹ (Fluticasone 25mcg, Salmeterol 25mcg)</p> | <p>Seretide 50/100 Accuhaler (DPI)¹ (Fluticasone 50mcg, Salmeterol 50mcg)</p> | <p>Seretide 50/250 Accuhaler (DPI)¹ (Fluticasone 50mcg, Salmeterol 50mcg)</p> | <p>Seretide 50/500 Accuhaler (DPI)¹ (Fluticasone 50mcg, Salmeterol 50mcg)</p> |
| <p>Beclomethasone 500mcg MDI¹</p> | <p>Beclomethasone 250mcg MDI¹</p> | <p>Pulmicort Turbuhaler (DPI)¹ (Budesonide 80mcg)</p> | | |
| <p>Flutiform 250/10 MDI¹ (Fluticasone 25mcg, Formoterol 5mcg)</p> | <p>Flutiform 125/5 MDI¹ (Fluticasone 12.5mcg, Formoterol 5mcg)</p> | <p>Relvar 100/25 Ellipta (DPI)^{1,2} (Fluticasone 100mcg, Vilanterol 25mcg)</p> | <p>Relvar 200/25 Ellipta (DPI)^{1,2} (Fluticasone 200mcg, Vilanterol 25mcg)</p> | <p>DuoResp Spiromax (DPI)³ (Budesonide 80mcg, Formoterol 4.5mcg)</p> |
| <p>Symbicort 160mcg/4.5mcg Turbuhaler (DPI)¹ (Budesonide 160mcg, Formoterol 4.5mcg)</p> | <p>Symbicort 160mcg/4.5mcg Rapihaler (MDI)¹ (Budesonide 160mcg, Formoterol 4.5mcg)</p> | <div style="border: 1px solid black; padding: 5px;"> <p>Not in formulary</p> <p>Symbicort 80mcg/2.25mcg Rapihaler (MDI)¹ (Budesonide 80mcg, Formoterol 2.25mcg)</p> </div> | | |

Abbreviations: SAMA – short-acting muscarinic antagonist, SABA – short-acting beta agonist, LAMA – long-acting muscarinic antagonist, LABA – long-acting beta agonist, ICS – inhaled corticosteroid, MDI – metered-dose inhaler, DPI – dry-powder inhaler, SM – soft mist inhaler

¹Photo credits from MedView (<https://www.medview.sg/>)

²Photo credits from MIMS Online (<http://www.mims.com/Singapore/home/index>)

³Photo courtesy of AstraZeneca

⁴Photo courtesy of GlaxoSmithKline

⁵Photo courtesy of AstraZeneca

⁶Photo courtesy of Teva Pharmaceuticals

A

= Asthma (HSA-registered indication)

C


= COPD (HSA-registered indication)

M

= HSA-registered indication for Maintenance and Reliever Therapy for Asthma

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What is TTSH Doing to Address This?



Tan Tock Seng
HOSPITAL
National Healthcare Group


























FOR MEDICAL PROFESSIONALS ONLY

RESPIRATORY INHALERS

At A Glance

The choice of inhalers is a shared decision-making process based on:

- Disease and its severity/control
- Technique of inhaler use
- Patient's satisfaction
- Environmental impact

| ICS/LABA | LAMA/LABA | LAMA | | |
|--|---|---|--|--|
| <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>DuoResp 160mcg/4.5mcg Spiromax (DPI)¹ (Budesonide 160mcg, Formoterol 4.5mcg)</p> </div> <div style="text-align: center;">  <p>Symbicort 160mcg/4.5mcg Turbuhaler (DPI)¹ (Budesonide 160mcg, Formoterol 4.5mcg)</p> </div> <div style="text-align: center;">  <p>Symbicort 80mcg/2.25mcg Rapihaler (MDI)¹ (Budesonide 80mcg, Formoterol 2.25mcg)</p> </div> <div style="text-align: center;">  <p>Symbicort 160mcg/4.5mcg Rapihaler (MDI)¹ (Budesonide 160mcg, Formoterol 4.5mcg)</p> </div> </div> | <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>Spiolto RespiMat (SMI)¹ (Tiotropium 2.5mcg, Olodaterol 2.5mcg)</p> </div> <div style="text-align: center;">  <p>Anoro Ellipta (DPI)³ (Umeclidinium 62.5mcg, Vilanterol 25mcg)</p> </div> <div style="text-align: center;">  <p>Ultibro Breezhaler (DPI)² (Indacaterol 110mcg, Glycopyrronium 50mcg)</p> </div> </div> | <div style="text-align: center;">  <p>Spiriva RespiMat (SMI)² (Tiotropium 2.5mcg)</p> </div> | | |
| <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>Seretide 25/125 Evohaler (MDI)¹ (Fluticasone 125mcg, Salmeterol 25mcg)</p> </div> <div style="text-align: center;">  <p>Seretide 25/250 Evohaler (MDI)¹ (Fluticasone 250mcg, Salmeterol 25mcg)</p> </div> <div style="text-align: center;">  <p>Seretide 50/100 Accuhaler (DPI)¹ (Fluticasone 100mcg, Salmeterol 50mcg)</p> </div> <div style="text-align: center;">  <p>Seretide 50/500 Accuhaler (DPI)¹ (Fluticasone 500mcg, Salmeterol 50mcg)</p> </div> </div> | <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>Pulmicort Turbuhaler (DPI)¹ (Budesonide 200mcg)</p> </div> <div style="text-align: center;">  <p>Beclomethasone 50mcg MDI¹</p> </div> <div style="text-align: center;">  <p>Beclomethasone 250mcg MDI¹</p> </div> </div> | <div style="text-align: center;">  <p>Incruse Ellipta (DPI)³ (Umeclidinium 62.5mcg)</p> </div> | | |
| <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>Seretide 50/250 Accuhaler (DPI)¹ (Fluticasone 250mcg, Salmeterol 50mcg)</p> </div> <div style="text-align: center;">  <p>Relvar 100/25 Ellipta (DPI)^{1,3} (Fluticasone 100mcg, Vilanterol 25mcg)</p> </div> <div style="text-align: center;">  <p>Relvar 200/25 Ellipta (DPI)^{1,3} (Fluticasone 200mcg, Vilanterol 25mcg)</p> </div> </div> | <div style="text-align: center;">  <p>Salbutamol 100mcg MDI¹</p> </div> | <div style="text-align: center;">  <p>Ipratropium 20mcg MDI¹</p> </div> | <div style="text-align: center;">  <p>Berodual MDI¹ (Fenoterol 50mcg, Ipratropium 20mcg)</p> </div> | <div style="text-align: center;"> <p>NOT IN FORMULARY</p>  <p>Trelveo Ellipta (DPI)³ (Fluticasone 100mcg, Umeclidinium 25mcg, Vilanterol 25mcg)</p> </div> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>Breztri (MDI)⁴ (Budesonide 160mcg, Glycopyrronium 7.2mcg, Formoterol 5mcg)</p> </div> <div style="text-align: center;">  <p>Trimbow (MDI)⁴ (Beclomethasone 100mcg, Glycopyrronium 12.5mcg, Formoterol 5mcg)</p> </div> </div> |

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ABBREVIATIONS: SAMA – short-acting muscarinic antagonist, SABA – short-acting beta agonist, LAMA – long-acting muscarinic antagonist, LABA – long-acting beta agonist, ICS – inhaled corticosteroid, MDI – metered-dose inhaler, DPI – dry-powder inhaler, SDI – standard drug list

A = Asthma (HSA-registered indication) **C** = COPD (HSA-registered indication) **M** = HSA-registered indication for Maintenance and Reliever Therapy for Asthma

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RESTRICTED



MDIs contain hydrofluorocarbon (HFC) propellants that are powerful greenhouse gases and can contribute to global warming. In comparison, DPIs and SMIs do not use these propellants and have substantially lower carbon footprints. However, there should be a shared decision-making between prescribers and patients.

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What is TTSH Doing to Address This?

| INHALERS | No of units dispensed | | | | | | Year-on-year growth rate | | | | |
|---|-----------------------|--------|--------|--------|--------|--------|--------------------------|------------------|------------------|------------------|------------------|
| | CY2019 | CY2020 | CY2021 | CY2022 | CY2023 | CY2024 | CY2019 to CY2020 | CY2020 to CY2021 | CY2021 to CY2022 | CY2022 to CY2023 | CY2023 to CY2024 |
| MDI SABA (SALBUTAMOL) | 28,986 | 27,871 | 27,466 | 27,048 | 27,039 | 23,796 | -3.8% | -1.5% | -1.5% | -0.03% | -12.0% |
| MDI SAMA (Ipratropium) | 928 | 1,865 | 2,071 | 2,651 | 3,106 | 2,598 | 101.0% | 11.0% | 28.0% | 17.2% | -16.4% |
| MDI SABA-SAMA (Berodual) | 2,025 | 1,495 | 1,118 | 739 | 539 | 384 | -26.2% | -25.2% | -33.9% | -27.1% | -28.8% |
| MDI ICS (Beclometasone) | 7,527 | 5,731 | 5,105 | 4,891 | 4,297 | 3,691 | -23.9% | -10.9% | -4.2% | -12.1% | -14.1% |
| MDI ICS-LABA (Seretide Evohaler, Symbicort Rapihaler, Flutiform) | 16,434 | 14,476 | 15,412 | 17,261 | 19,325 | 19,697 | -13.0% | 6.5% | 12.0% | 12.0% | 1.9% |
| MDI TOTAL | 55,900 | 51,438 | 51,172 | 52,590 | 54,306 | 50,166 | -8.0% | -0.5% | 2.8% | 3.3% | -7.6% |
| DPI ICS (Budesonide Turbuhaler) | 890 | 655 | 675 | 596 | 554 | 390 | -26.4% | 3.1% | -11.7% | -7.0% | -29.6% |
| DPI ICS-LABA (Seretide Accuhaler, Symbicort Turbuhaler, Relvar Ellipta, DuoResp) | 8,959 | 9,247 | 10,821 | 11,757 | 14,898 | 16,435 | 3.2% | 17.0% | 8.6% | 26.7% | 10.3% |
| DPI & SMI LAMA (Incruse, Spiriva) | 9,897 | 9,379 | 9,973 | 10,336 | 11,939 | 11,664 | -5.2% | 6.3% | 3.6% | 15.5% | -2.3% |
| DPI & SMI LAMA-LABA (Anoro, Spiolto, Ultibro) | 7,529 | 7,066 | 8,249 | 8,923 | 10,406 | 11,672 | -6.1% | 16.7% | 8.2% | 16.6% | 12.2% |
| DPI & SMI TOTAL | 27,275 | 26,347 | 29,718 | 31,612 | 37,797 | 40,161 | -3.4% | 12.8% | 6.4% | 19.6% | 6.3% |
| All Inhalers TOTAL | 83,175 | 77,785 | 80,890 | 84,202 | 92,103 | 90,327 | -6.5% | 4.0% | 4.1% | 9.4% | -1.9% |
| % of MDI:All Inhalers | 67.2% | 66.1% | 63.3% | 62.5% | 59.0% | 55.5% | | | | | |

In two years, the proportion of MDIs dispensed has fallen from 62.5% to 55.5%, saving approx. 1.2 million km car emissions.

What else will TTSH do in 2025?

- Since 26 February 2025, TTSH Pharmacists have been encouraging patients to limit the number of Salbutamol inhalers dispensed to 2. This will
 - Promote better asthma and COPD care
 - Minimise medication wastage
 - Reduce environmental impact

How Can the Public Reduce MDI Use?

- **Disease Control**
 - Good disease control will optimise the number of inhalers used. This will in turn reduce the environmental impact of inhalers.
 - Overuse of Salbutamol MDI is associated with increased exacerbations (attacks) and increased mortality.
- **Personalised Care**
 - Inhalers are a vital part of asthma and COPD treatment.
 - Good inhaler technique will keep the lungs healthy.
- **Inventory Watch**
 - Check the number of unused and unexpired inhalers at home, and do not collect an excess of supply from the Pharmacy. Obtaining the right number of inhalers from the Pharmacy will reduce wastage.

Thank You 

