Reducing the Carbon Footprint in Healthcare: Quantifying the Carbon Emission Reduction by Eliminating Metered-Dose Inhalers in a Hospital

Vaishnavi Parchuri, MD, Emily Braverman, PharmD,
Shana Szymborski PharmD, MHS, BCPS, Joseph Reilly, BS, PharmD, BCGP, Inga Robbins, MD
AtlantiCare Regional Medical Center, Atlantic City, N.J., U.S.A.

Introduction

- Metered-dose inhalers (MDIs) and dry powder inhalers (DPIs) significantly contribute to greenhouse gas emissions and hospital-generated plastic waste. Most emissions from MDIs are attributable to hydrofluorocarbon (HFC) propellants, which are potent greenhouse gases.
- Designed for single-patient use, MDIs utilize hydrofluoroalkane (HFA) propellants, a class of HFCs with high global warming potential measured in CO_2-equivalents. In contrast, DPIs do not use propellants and have a much lower carbon footprint.
- Our hospital transitioned from single-use MDIs and DPIs to nebulized therapy, where clinically appropriate. This study aims to quantify the positive environmental impact of this transition by determining the reduction in CO_2-equivalent emissions.

Methods

- We conducted a retrospective analysis of institutional pharmacy expenditure data for inhaled respiratory medications in 2023 and 2024. Medication-level spending was extracted from pharmacy records and grouped under inhaler therapies. Inhalers were classified by device type based on formulation (MDIs - ProAir, Ventolin, Atrovent, Flovent) and DPIs - Ellipta and Diskus-based therapies, including Breo, Anoro, Incruse, Arnuity, and Serevent)
- Total annual expenditure for each device category was calculated and converted to estimated device counts using assumed average acquisition costs of $50 per MDI and $300 per DPI. Greenhouse gas emissions were calculated using established device-specific emission factors of **20 kg CO_2e per MDI** and **2 kg CO_2e per DPI.**
- Using drug-level expenditure data and device-specific emission factors, inhaler-related CO_2 emissions decreased from 14,302 kg in 2023 to 7,868 kg in 2024, and to 0 kg in 2025 following the complete transition to nebulized therapy. Descriptive statistics, including totals and averages, were used to summarize inhaler usage and environmental impact. This study was approved by our Institutional Review Board.

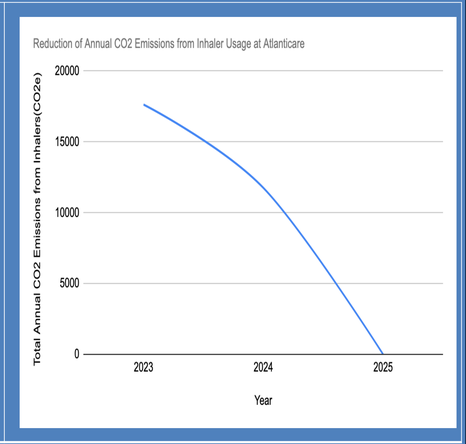
Results

Comparison of Inhaler-Related Greenhouse Gas Emissions between 2024 and 2025

2023
- 1121 inhalers were used
- 670 MDIs and 451 DPIs
- MDIs – 20 kg CO2e per inhaler
- DPIs – 2 kg CO2e per inhaler
- Total emissions = 14,302 KgCO2e

2024
- 840 inhalers were used
- 362 MDIs and 314 DPIs
- Total emissions = 7868 KgCO2e

2025
- Transitioned to nebulized treatment
- Emissions from inhaler use were ZERO.



Medication	2023 Spend	2024 Spend
Inhaler		
Anoro	$12,022.18	$7,347.90
Incruse	$14,574.42	$9,904.86
Proair	$5,432.79	$4,607.73
Ventolin	$10,142.08	$9,467.71
Atrovent	$15,622.08	$4,011.54
Breo 100 mcg	$61,422.53	$44,368.95
Breo 200 mcg	$38,246.10	$29,109.27
Arnuity 100 mcg	$3,109.78	$2,079.23
Arnuity 200 mcg	$2,076.47	$1,471.29
Flovent	$2,292.92	$0.00
Serevent	$3,925.60	$0.00
Spiriva	$0.00	$0.00
INHALER TOTAL	$168,866.95	$112,368.48

Environmental Impact

14,302 metric tonnes Co2e avoided

Equivalent to:

Annual electricity use for 2 US homes

or

Driving around the Earth 1.4 times

Would require about 1,700 trees to absorb this in 1 year

Conclusion

We demonstrated that routine inpatient prescribing practices can carry a meaningful environmental footprint. This project highlights how practical changes in clinical workflows can translate into substantial sustainability gains, without compromising patient care.

Disclosure panel: The authors have nothing to disclose concerning financial or personal relationships with commercial entities that may have a direct or indirect interest in the subject matter.