Assessment of Metered Dose Inhaler (MDI) vs MDI and Spacer – impact on patient, health care system and the environment

PURPOSE

MDIs are the most common type of inhaler in North America and an important device option for many respiratory patients. The addition of a spacer has been shown to:



The objective of this assessment was to evaluate the general impact of treating patients with a MDI/Spacer delivery system rather than MDI alone, using literature search and scenario modeling.

METHODS

A literature search was undertaken to identify published pharmacokinetic (PK) studies in which lung delivery data was generated directly comparing MDI alone and MDI/AeroChamber* brand of spacer systems, the aim being to assess the relationship and determine the average ratio. Based upon the observed relationship, modelled impact assessments were generated for both reliever and controller MDIs in terms of:







RESULTS

Three published pharmacokinetic (PK) studies were identified using current MDIs, all of which reported direct comparisons between MDI and MDI/Spacer (AeroChamber Plus* brand) lung delivery.

Focusing on the AUC data, it was observed that the mean MDI alone deliveries to the lungs (as percentage of mean delivery for MDI/Spacer combination) were 35%, 39% and 70%. As such, a grouped average of 48% (or a 2x increase if viewed as MDI to MDI/VHC) was used for the impact assessments.

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		2500	
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		1000	0,tlast)
		500	AUC (
		0	
	Best		
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For **Reliever MDIs** it was modelled that the potential impact of switching MDI to MDI/Spacer for patient was quicker relief of symptoms, for health care system was up to a 50% saving in the cost of MDIs, and for the environment was up to 50% reduction in carbon emissions.

For **Controller MDIs** it was modelled that the potential impact of switching MDI to MDI/Spacer for patient was better disease control and management of symptoms plus less ICS related side effects, for health care system was savings due to less step ups in dose and less hospitalizations, and for environment was no change or reduction in carbon emissions if patient was on MART therapy.

Suggett, J, Nagel, M

Trudell Medical International, London, ON, Canada



Study	MDI	Subjects	Mean age	Mean Area Under Curve (AUC) for MDI alone / Mean AUC for MDI + <i>AeroChamber</i> * VHC
1 Dorinsky P et al. <i>Relative</i> <i>Bioavailability of Budesonide/</i> <i>Glycopyrrolate/Formoterol Fumarate</i> <i>Metered Dose Inhaler Administered</i> <i>With and Without a Spacer: Results of</i> <i>a Phase I, Randomized, Crossover Trial</i> <i>in Healthy Adults.</i> Clin Ther. 42 (2020), 634-648.	Breztri ⁺ / Trixeo ⁺ (Budesonide, Glycopyrrolate, Formoterol Fumarate)	56 healthy adults	29.9 years	50%, 29%, 27% → 35%
2 Gillen M et al. Effect of a spacer on total systemic and lung bioavailability in healthy volunteers and in vitro performance of the Symbicort [®] (budesonide / formoterol) pressurized metered dose inhaler. Pulmon Phar Ther. 2018 Oct;52:7-17.	Symbicort [†] (Budesonide, Formoterol Fumarate)	50 healthy adults	42 years	41%, 37% → 39%
3 Singh D et al. <i>Effect of AeroChamber</i> <i>Plus on the lung and systemic</i> <i>bioavailability of beclomethasone</i> <i>dipropionate / formoterol pMDI</i> . British Journal of Clinical Pharmacology. 72:6; 932–939. 2011.	Fostair ⁺ / Foster ⁺ (beclometasone dipropionate / formoterol)	12 healthy adults	29.2 years	71%, 69% → 70%
				48% (grouped average)

	Addition of AceroChamber* VHC	Patient / Clinical	Health Care System	Image: Constraint of the second sec
RELIEVER	 Average lung dose Improved coordination 	 Quicker relief of symptoms QoL 	 Reduce MDI costs by up to 50% Reduce incidence of hospital visits for exacerbations 	 Less MDIs Reduce carbon emissions by up to 50%
CONTROLLER	 Average lung dose ✓ oropharyngeal deposition related side effects Improved coordination 	 Improve disease control Improve QoL ↓ oropharyngeal deposition related side effects 	 Increase disease control ↓ hospital visits (↓ \$) ↓ step-up therapy (↓ \$) ↓ MART MDIs (↓ \$) 	 MART therapy: Less MDIs Reduce carbon emissions by up to 50%

CONCLUSION & CLINICAL IMPLICATIONS

For subjects with perfect inhaler coordination, the PK studies showed it was possible to achieve similar lung delivery using MDI alone compared to MDI with Spacer, however not many people had perfect coordination as on average the MDI alone delivery to the lungs was only 48% for MDI alone users (compared to with Spacer).

In the modelled impact assessment such a difference translated to significant potential benefits to the patient, health care system and environment when moving to a MDI/ Spacer delivery system.

It is recognized that there is some variability between different MDIs, not everyone may use a Spacer and that there are alternative inhaler delivery systems to consider, however, based upon the improved lung delivery outcomes, there is compelling evidence to consider the broader use of spacers in the global patient population.

Patient/Clinical



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