Evaluation of Child-Mask Spacers Using an Oro-nasopharynx Model for the Aerosol Delivery of a Widely Prescribed Corticosteroid

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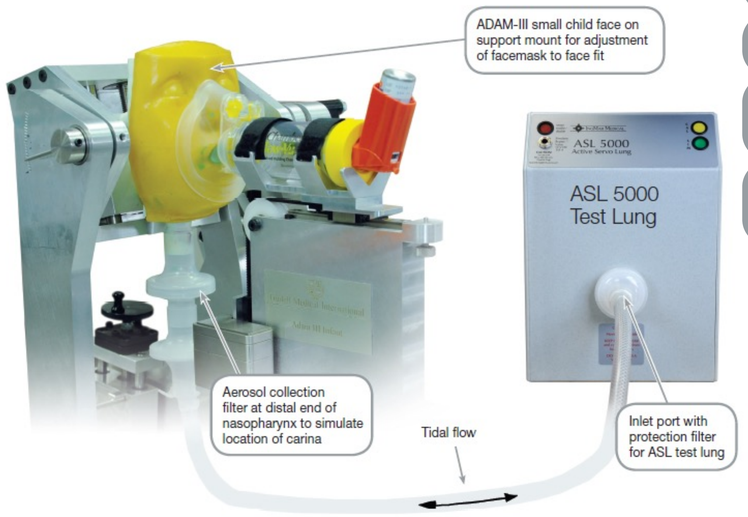
RATIONALE

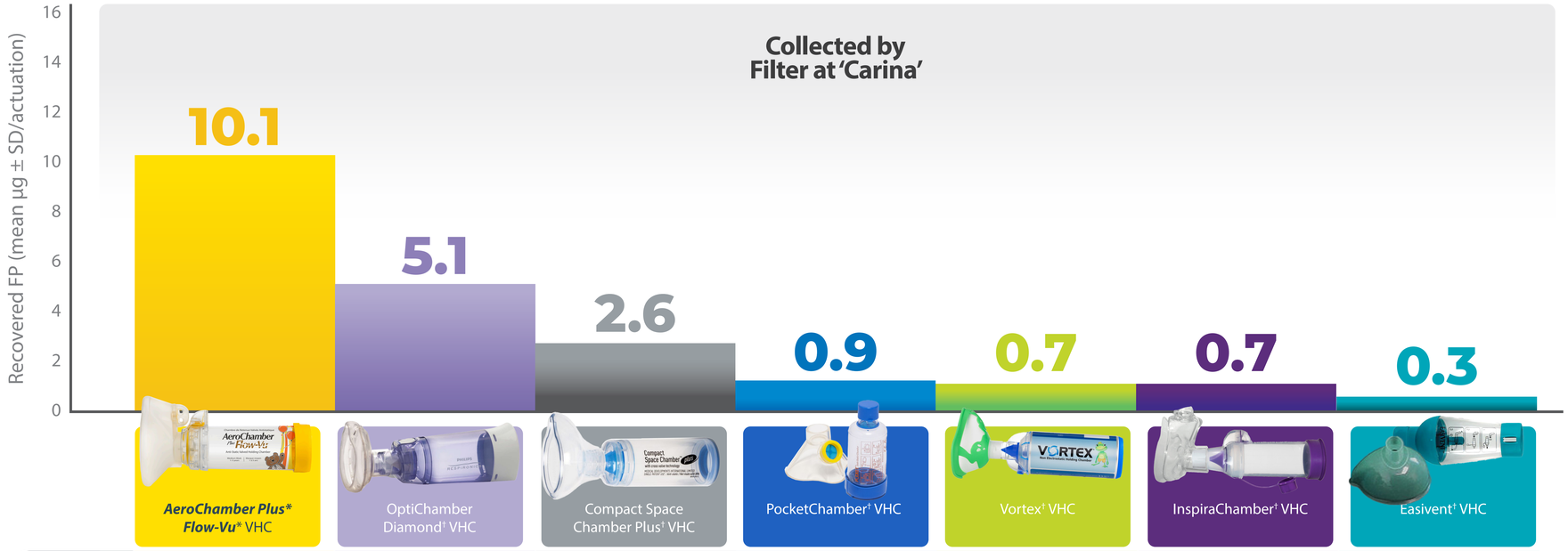
The use of a model that includes soft face tissue simulation and an anatomically correct oropharyngeal airway is an effective means to evaluate MDI+valved holding chamber with a mask. We report a study in which several child-mask spacers (*n*=5/group) were evaluated using a model of a 4-year-old child.

METHODS

Each spacer with mask was attached to the anatomical model and the airway coupled to a breathing simulator (ASL5000) via a filter located at the exit to capture drug particles that penetrated as far as the carina. The breathing simulator was programmed to simulate a coordination delay of 2 s before inhalation, followed by tidal breathing (tidal volume = 155-mL, I:E ratio = 1:2, rate = 25 cycles/min). 5-actuations of Flovent† 50 were delivered at 30-s intervals and recovered from specific locations in the aerosol pathway and assayed by HPLC.



RESULTS



	AeroChamber Plus Flow-Vu** VHC	OptiChamber Diamond† VHC	Compact Space Chamber Plus† VHC	PocketChamber† VHC	Vortex† VHC	InspiraChamber† VHC	Easivent† VHC
Retained by Chamber	17.5±1.6	22.7±2.7	28.4±3.3	37.6±3.1	36.2±3.8	39.2±2.7	31.7 ± 5.2
Deposited Inside Facemask	1.4±0.2	3.4±0.8	0.1±0.1	0.7±0.1	0.5±0.7	1.0±0.2	0.4 ± 0.3
Deposited on Face	0.6±0.4	0.5±0.3	0.0±0.0	0.3±0.0	0.1±0.1	0.2±0.1	0.0±0.0
Deposited in Upper Airway	1.1±0.2	0.7±0.1	0.0±0.0	0.3±0.1	0.3±0.1	0.2±0.0	0.0±0.0
Collected by Filter at 'Carina'	**10.1±1.0**	**5.1±0.9**	**2.6±1.6**	**0.9±0.5**	**0.7±1.1**	**0.7±0.1**	**0.3 ± 0.2**

CONCLUSIONS

- Significantly more FP was delivered to the filter/carina with the ***AeroChamber Plus* Flow-Vu**** spacer than with any of the other spacers (un-paired t-tests, $p < 0.001$).
- Mask fit, spacer (shape, capacity, material) and valve design may account for the large differences in drug delivery.
- Clinicians need to be aware that not all spacers are the same and will potentially deliver significantly different amounts of drug.

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American Thoracic Society Conference
May 17 - 22, 2024