

# METERED DOSE INHALER (MDI) WITH VALVED HOLDING CHAMBER (VHC) VS DRY POWDER INHALERS (DPIs): USING FUNCTIONAL RESPIRATORY IMAGING (FRI) TO ASSESS MODELLED LUNG DEPOSITION IN AN ASTHMATIC PATIENT.

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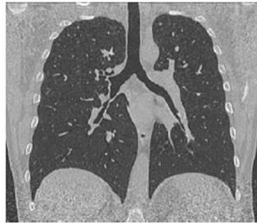
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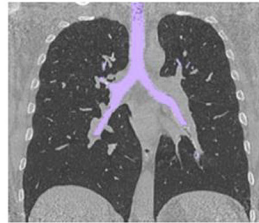
## RATIONALE

- Both MDIs and DPIs can be used to deliver drugs to manage Asthma.
- Valved Holding Chambers (VHC) can be used to help patients with inhalation coordination of their MDIs.
- Inspiratory flow rate is known to influence drug delivery. This FRI based study assessed the modelled airway drug delivery from an MDI/VHC system and two DPI systems at optimal and suboptimal flow rates.



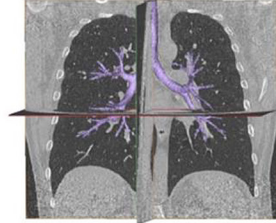
HRCT

1. Patient data is obtained by taking low dose CT scans.



Structure Segmentation

2. Patient-specific airway and lung structures are extracted.



Patient-specific 3D model

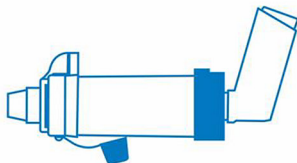


Flow simulation (CFD)

3. Flow and particle simulations are applied to the 3D models.

## METHODS

- Three dimensional geometries of airways and lobes were extracted from a CT scan of a 21 year old male Asthma (moderate) patient.
- Drug delivery and airway deposition was modelled using FRI with measured particle and plume characteristics via the following devices:



AEROCHAMBER PLUS® FLOW-VU® ((AC+) valved holding chamber (VHC), Trudell Medical International) delivering salbutamol from a Ventolin® EvoHaler® pMDI (100 µg; GSK)



Symbicort<sup>†</sup> Turbuhaler<sup>†</sup> (6 µg formoterol fumarate/200 µg budesonide; AstraZeneca)



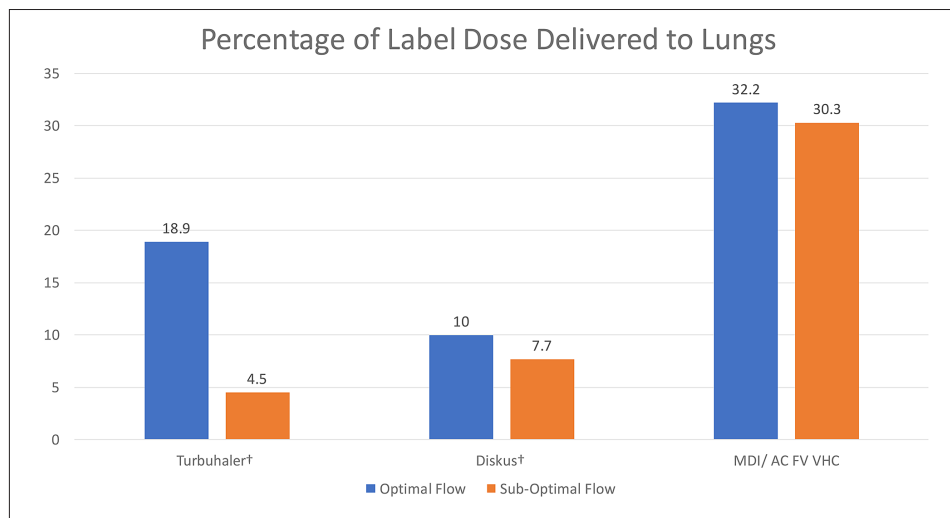
Seretide<sup>†</sup> Diskus<sup>†</sup> (50 µg salmeterol xinafoate/250 µg fluticasone propionate; GSK)

- Inhalation flowrates of 30 L/min (optimum for MDI/VHC, suboptimal for DPIs) and 60 L/min (optimum for DPIs, suboptimal for MDI/VHC) were assessed.

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## RESULTS

- The modelled lung deposition results are shown in the chart, expressed as a percentage of label dose, using both optimal and suboptimal inhalation flow rates.



## CONCLUSIONS

- The FRI deposition profiles highlight that the MDI/AEROCHAMBER PLUS® FLOW-VU® VHC system delivered an appreciably greater percentage of drug to the lung region than either of the two DPIs.
- The influence of inhalation flow profile was less with the MDI/VHC system and differed between the two DPIs.

