Assessment of real-world patient inhalation techniques with a Metered Dose Inhaler and Smart Spacer: Which errors are observed and can these be addressed through tailored education?

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SUMMARY | Data from a Smart Spacer study was analyzed for 29 patients and determined that most patients had peak inhalation flows higher than ideal during the baseline period. Patients in the intervention group received tailored training to correct this error, and many of them corrected this aspect of inhalation technique during the follow up period.

INTRODUCTION

- Although inhaler technology has been on the market for over 50 years and the technology has evolved, they are often still used incorrectly.

- A systematic review reported that on average only 30% of patients had good technique from the 1960s to 2014.[1]

- A separate systematic review reported that only 15% of health care professionals (HCPs) understood good technique.[2]

- Recently, 'Smart' inhalers have been developed with the aim of improving patient adherence to therapy, including improving inhaler technique.[3,4,5]

- One prototype device being clinically investigated is a Smart Spacer (valved holding chamber) which can identify the MDI being used and monitor adherence to dosing regimen and inhaler technique.

- These use of these devices in clinical studies enables assessment of real-world patient inhaler techniques, gathered in a non-supervised and therefore more realistic environment.

- This poster reports patient inhaler technique assessments when using an MDI with Smart Spacer for an adult asthma study[6] performed in the Netherlands with the objective of understanding general variability of some standard technique metrics as well as subsequent observations following feedback and customized training from HCPs.
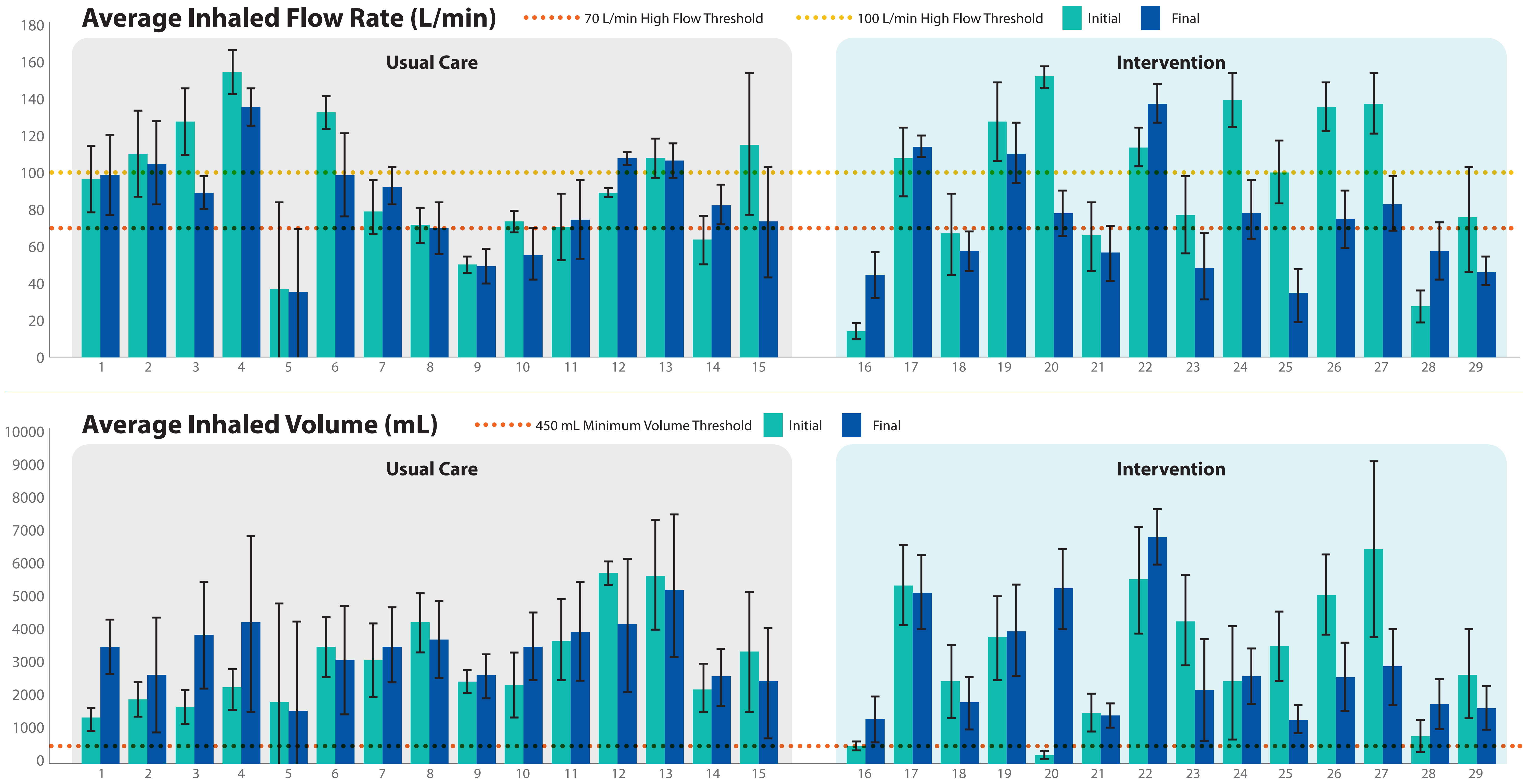
METHODS

- The clinical study was performed in primary care in the Netherlands, with data analysed from 29 adult asthma patients. All patients were provided standard inhaler training prior to 1 month use of their MDIs with Smart Spacer. 15 patients, the control group, then had a meeting with their HCP and were given standard training again followed by a further 1 month Smart Spacer use. 14 patients, the intervention group, followed a similar pathway, except that the 1 month HCP meeting included customized training based on review of the technique data from the first month. Spacer technique data was evaluated with respect to the following metrics:

  1. Peak inhalation flow rate (anything above 70 L/min flagged as a warning for being too high)

  2. Inhaled volume (anything below 450ml flagged as a warning for being too low)

  3. Delay between MDI actuation and patient inhalation (anything above 5 seconds flagged as being too long)

- Data analysis of these metrics was performed comparing the first and second months of treatment for both the control and intervention groups, for each of the three technique metrics.

RESULTS

- Inhalation delay technique was good for all patients throughout the study, with average delays between MDI actuation and inhalation being generally below 2 seconds.

Average Inhaled Flow Rate (L/min) — 70 L/min High Flow Threshold · 100 L/min High Flow Threshold · Initial · Final · Usual Care · Intervention

Average Inhaled Volume (mL) — 450 mL Minimum Volume Threshold · Initial · Final · Usual Care · Intervention

CONCLUSIONS

- Despite all patients receiving usual care inhaler technique training at the start of the study, the majority of patients had average peak inhalation flow rates higher than the ideal range and almost half were above 100 L/min during baseline first month. This technique error was corrected in a large number of patients in the intervention group where the training at the 1-month visit focused on this specific aspect of technique.

- Inhaled volume was generally satisfactory for this patient population, potentially helped by the fact that patients in the Netherlands are trained to use multiple tidal breaths rather than a single deep inhalation. Two patients in the intervention group had low inhaled volumes during the first month and they both improved following the customized training.

- This study was able to provide real-world insights into adult asthmatic inhalation techniques, highlighting the common and potentially detrimental (to drug delivery) error of high inhaled flow rate. The results also demonstrated the ability of the Smart Spacer to highlight specific errors, thus enabling the HCP to focus and tailor their consultation time on the key areas with subsequent improvements in technique observed.

- Future studies should investigate whether the technique errors return over time or if the face-to-face education enables a sustained improvement in inhaler technique. It would also be interesting to evaluate an adult population who were trained with the single slow deep inhalation technique to see if the inhaled volume results remained generally good, as well as a paediatric population where one might anticipate smaller lung volumes.

1 Sanchis J, Gich I, Pedersen S. Systematic review of errors in inhaler use: has patient technique improved over time? Chest. 2016; 150(2): 394–406. 2 Plaza M, Giner J, Rodrigo GJ, et al. Errors in the use of inhalers by health-care professionals: a systematic review. J Allergy Clin Immunol Pract. 2018; 6(3): 987–95. 3 Chan AHY, Pleasants RA, Dhand R, et al. Digital inhalers for asthma or chronic obstructive pulmonary disease: a scientific perspective. Pulm Ther. 2021; 7(2): 345–76. 4 Dierick BA, Wiarda MBR, Hew M, Chan AHY, van Boven JFM. Electronic Monitoring devices to support personalized inhaler use education in patients with asthma. The randomized controlled OUTERPRICE trial. Resp Medicine. 2023, Nov 218: 107379. 5 Dierick B, Achterbosch M, Eikholt AA et al. Electronic monitoring with a digital smart spacer to support personalised inhaler use education in patients with asthma. Cur Treatment Options in Allergy. 2023; 10:39–52. 6 MD-676A-1025 © trademarks and registered trademarks of Trudell Medical International. 1 trademarks of their respective companies. Copyright © Trudell Medical International 2025.