Customer is always right: optimising inhaler design to fit patient preferences in obstructive lung disease

Andrew Gangemi, Victor Kim, Gerard Criner

Patient confidence in their inhaler regimen is essential in the management of asthma and COPD. Inhaler misuse is associated with poorer symptom control, more frequent use of oral corticosteroids and antibiotics for rescue, and more frequent hospitalisations in both COPD and asthma.[1] Device designs have expanded to allow for ease of use; each device has its benefits and drawbacks. Metered dose inhalers (MDIs) are pressurised and therefore less reliant on inspiratory effort. Breath-actuated MDIs, while more expensive and limited in range of agents, help to minimise timing errors. Dry powder inhalers also require less coordination but may be less effective with higher degrees of airflow obstruction. Soft mist inhalers offer extremely low resistance, improved delivery to the deeper respiratory tract, and less deposition in the oropharynx and upper trachea. There is currently only one soft mist device approved by the FDA, which limits the number of available agents through this delivery method.[2] Education during initiation and follow-up is key for ensuring effective drug delivery, as technical errors are as frequent as 30% during each individual step.[1]

In this issue of *Thorax*, Tervonen *et al* provide additional insight into patient preferences by conducting one of the largest discrete choice experiments (DCE) of inhaler regimens in obstructive lung disease to date.[3] A key inference from this analysis is the influence of disease control on patient preference—in those with frequent symptoms, faster onset of action is the most preferred attribute. Convenience factors such as a pressurised delivery system, a metered counter and a once-daily over twice-daily dosing were also preferred but to a lesser extent than symptoms relief. Patients' perception of inhaler efficacy is important, as suboptimal symptoms control may lead to non-compliance and downstream decline in lung function.[4] Among the long-acting bronchodilators, the beta agonists formoterol, indacaterol and olodaterol appear to have the fastest onsets of action while glycopyrronium has the quickest onset among muscarinic antagonists.[4]

This supports previous DCEs that found symptom relief as a key driver of inhaler selection in patients with asthma and COPD, particularly among symptomatic patients.[5] Another recent multinational DCE found avoidance of adverse events to be the most important factor in inhaler regimen selection among patients with COPD.[6] While there are slight nuances in the conclusions drawn, these can be explained by differences in sample sizes (this current study had nearly 2000 patients while others recruited nearly 300–450 patients) as well as how the DCE questions were formulated. This current study was much more specific in its definitions, using 5-year adverse event risks to gain more granular understanding of risk–benefit tradeoffs acceptable for patients. Inhaled corticosteroids can cause minor issues such as candidiasis and dysphonia, as well as adrenal suppression, ophthalmologic complications and osteoporosis; absorption can be affected by obstructive physiology but seems independent of device types.[7] The risk of pneumonia also poses a major concern among clinicians and patients, as also evidenced in this study by the willingness to accept nearly a 15 min increase in onset of action and 1 additional yearly exacerbation for a 50% reduction in 5-year pneumonia risk. Among those with better symptoms control as evidenced by well-validated tools such as the Asthma Control Questionnaire and COPD Assessment Test, reducing these downstream consequences play a bigger role in their selection choices.[3]

While prescribers may consider these factors when choosing an inhaler regimen, choice limitations by insurance formularies add to the complexity of providing optimal medication delivery. The results of this current analysis may be more applicable to pharmaceutical companies in developing and choosing devices to bring to market. However, given that this particular study was industry funded, several concerns must be considered. Pharmaceutical industry funding is highly prevalent in clinical trials, particularly comparative drug trials where industry sponsorship exceeds 80%.[8] Funders can play a substantial role in trial design including comparator choice, study conduct and data analysis. Conceivably, DCE questions could favour selection of a company's currently available product. However, academic authors still have significant control over manuscript preparation and data oversight and most disagreements with funders are minor.[8] In this experiment, the characteristics chosen for this DCE were vetted through qualitative patient focus groups to allow for selection of attributes important to patients rather than funders. And while this was a mixed population of obstructive lung diseases overall, both asthma and COPD were considered separately given the intrinsic differences in both demographics and daily symptom burden and quality.

Overall, the management of obstructive lung disease has become more personalised with therapies that focus on disease phenotypes such add-on medications for frequent exacerbators, use of biologics in eosinophilic-driven airways obstruction and bronchoscopic lung volume reduction in particular emphysematous destruction patterns. While traditionally device types were thought to play a major role in inhaler selection, the work by Tervonen *et al* also sheds new light in the importance of disease burden and how to better tailor therapy to patient preferences.

Department of Thoracic Medicine and Surgery, Lewis Katz School of Medicine at Temple University, Philadelphia, Pennsylvania, USA

Correspondence to Dr Andrew Gangemi, Department of Thoracic Medicine and Surgery, Lewis Katz School of Medicine at Temple University, Philadelphia, PA 19140, USA; andrew.gangemi@tuhs.temple.edu

Contributors AG took lead role in preparation and literature review for this editorial. VK and GC provided guidance and oversight.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent for publication Not required.

Provenance and peer review Commissioned; externally peer reviewed.

To cite Gangemi A, Kim V, Criner G. *Thorax* 2020;**75**:711–712.

Accepted 2 June 2020
Published Online First 6 July 2020

► http://dx.doi.org/10.1136/thoraxjnl-2019-213974

Thorax 2020;**75**:711–712.
doi:10.1136/thoraxjnl-2020-215238

REFERENCES

1 Melani AS, Bonavia M, Cilenti V, *et al*. Inhaler mishandling remains common in real life and is associated with reduced disease control. *Respir Med* 2011;105:930–8.
2 Rogliani P, Calzetta L, Coppola A, *et al*. Optimizing drug delivery in COPD: the role of inhaler devices. *Respir Med* 2017;124:6–14.
3 Tervonen T, Hawken N, Hanania N, *et al*. Maintenance inhaler therapy preferences of patients with asthma or chronic obstructive pulmonary disease: a discrete choice experiment. *Thorax* 2020;75:735–43.
4 Cazzola M, Beeh KM, Price D, *et al*. Assessing the clinical value of fast onset and sustained duration of action of long-acting bronchodilators for COPD. *Pulm Pharmacol Ther* 2015;31:68–78.
5 Svedsater H, Leather D, Robinson T, *et al*. Evaluation and quantification of treatment preferences for patients with asthma or COPD using discrete choice experiment surveys. *Respir Med* 2017;132:76–83.
6 Lewis HB, Schroeder M, Gunsoy NB, *et al*. Evaluating patient preferences of maintenance therapy for the treatment of chronic obstructive pulmonary disease: a discrete choice experiment in the UK, USA and Germany. *Int J Chron Obstruct Pulmon Dis* 2020;15:595–604.
7 Tattersfield AE, Harrison TW, Hubbard RB, *et al*. Safety of inhaled corticosteroids. *Proc Am Thorac Soc* 2004;1:171–5.
8 Rasmussen K, Bero L, Redberg R, *et al*. Collaboration between Academics and industry in clinical trials: cross sectional study of publications and survey of lead academic authors. *BMJ* 2018;363:k3654.