

## ORIGINAL RESEARCH



## Asthma patient satisfaction with different dry powder inhalers

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### ABSTRACT

**Background:** The preferences and opinions of patients are important when choosing the optimal inhaler device for asthma management. We compared patient satisfaction of three dry powder inhalers in patients with moderate to severe asthma.

**Methods:** We selected a group of patients treated with Easyhaler<sup>TM</sup> (n = 164) and a second group of patients treated with Turbuhaler<sup>TM</sup> (n = 100) or Diskus<sup>TM</sup> (Accuhaler<sup>TM</sup>) (n = 64) from the register of an observational, multicenter study. Data of patients were paired according to age, gender, and asthma severity. Patient satisfaction with the inhaler type was assessed with the specific 'Feeling of Satisfaction with Inhaler' (FSI-10) questionnaire.

**Results:** Specific satisfaction with inhaler was statistically significantly higher with Easyhaler<sup>TM</sup>, as well as the percentage of patients with high satisfaction with inhaler. (FSI-10 score  $\geq 43$ ). Scores for Easyhaler<sup>TM</sup> were also statistically significantly better for individual FSI-10 items such as learning how to use, inhaler preparation, inhaler use, weight and size, and portability. There were no significant differences in asthma control (ACT, Mini-AQLQ) and adherence (TAI global score).

**Conclusions:** Specific satisfaction with inhaler was higher with Easyhaler<sup>TM</sup> in a homogeneous population of patients with moderate to severe asthma. However, the relationship between satisfaction with the inhaler and adherence and asthma control deserves more investigation.

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Asthma; dry powder inhaler; patient satisfaction; adherence

## 1. Introduction

When choosing asthma inhaled therapy, taking into account the preferences and opinions of patients can improve adherence and asthma control [1,2]. Patient satisfaction with inhaler has been related to more favorable clinical outcomes [3], just as difficulties using the inhaler have been shown to contribute to poor adherence [2]. Thus, inhaler choice is considered key for asthma control [4].

Dry powder inhalers (DPIs) are used in asthma therapy [2]. However, they present different features that may have clinical implications [5]. Easyhaler<sup>TM</sup> (EH) (Orion Corporation, Finland), is a three-step, light, compact, and user-friendly DPI. It has advantages over older DPIs [6], including dose uniformity in different real-world conditions [7]. With regard to features such as perception of inhalation, size, discreetness, mouthpiece comfort, and dose counter, EH was rated higher than other inhaler devices by asthma patients [8]. In an observational, multicenter study, patient satisfaction with inhaler was higher in asthma patients treated with EH [9]. Here we present a *post-hoc* analysis of a homogeneous

subpopulation of this study. Our objective was to compare EH and other DPIs regarding patient satisfaction with inhaler and potential clinical differences.

## 2. Materials and methods

The method used in the ASCONA (Asthma Satisfaction, CONTROL and Adherence) study has been previously reported [9]. Briefly, the ASCONA scientific committee selected and invited the participating physicians. This selection aimed to achieve an appropriate geographical distribution across Spain, as well as involving centers providing different levels of healthcare. Seventy-three investigators (50.7% allergists and 49.3% pulmonologists) participated in the study. They selected 800 consecutive patients according to the inclusion criteria: age  $\geq 18$  years, physician-confirmed asthma diagnosis, moderate to severe asthma according to GINA guidelines [2], and in receipt of any kind of asthma medication with the same inhaler for at least 3 months prior to their inclusion in the study. This last criterion was intended to assure that patients were under steady treatment without

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📄 Supplemental data for this article can be accessed here.

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recent changes. Prior and current medications were registered and analyzed. Patients with disabling comorbidities and/or cognitive dysfunction were excluded. All patients signed an informed consent form, no personal data were recorded, and neither physicians nor patients received any compensation for their participation.

Physicians and patients completed electronic data collection forms in a single visit. We recorded sociodemographic and clinical data, including age at asthma diagnosis and at therapy onset, current asthma therapy, and asthma severity and control according to GINA [2]. We also included several questionnaires and tests. We assessed satisfaction with the specific Feeling of Satisfaction with Inhaler (FSI-10) questionnaire [10] and the more general Treatment Satisfaction Questionnaire for Medication (TSQM) [11]. For adherence, we used the Test of Adherence to Inhalers (TAI) to assess the specific adherence to inhalers [12] and the 4-item Morisky-Green scale for the general adherence to treatment (where 0 is no adherence and 4 is good adherence) [13]. We also used the Asthma Control Test (ACT) [14] and the reduced version of the Asthma Quality of Life Questionnaire (Mini-AQLQ) [15,16]. All these instruments have been validated in Spanish [10,12,17–20]. Furthermore, FSI-10 and TAI have been developed in Spain.

The specific FSI-10 questionnaire assesses the portability and usability of inhalers regardless of administered drugs. Patients answer ten questions, each with five options, using a Likert scale from 5 (very) to 1 (hardly at all). The FSI-10 maximum score is 50 (maximum satisfaction) [10] (see Supplementary file 1).

In turn, TAI consists of two complementary questionnaires. The 10-item TAI is completed by the patient and identifies the level of adherence: good (50 points), intermediate (46–49 points), and poor ( $\leq 45$  points). In turn, the 12-item TAI suggests the pattern of non-compliance. It includes the 10-item TAI plus two items that are answered by the physician: knowledge of the dosing regimen by the patient (item #11) and performance of inhalation technique without critical errors (item #12) [12] (see Supplementary file 2).

The study was conducted according to the Declaration of Helsinki. The Clinical Research Ethics Committee of the Hospital Clinic in Barcelona (Spain) approved its protocol.

The more common DPIs in the ASCONA register were EH, Turbuhaler™ (TH) (AstraZeneca, Sweden) or Diskus™ (Accuhaler™) (DKAH) (GSK, United Kingdom). They also were the only ones with an adequate number of patients to perform statistical analyses. In a prior analysis of the ASCONA registry, study investigators included 739 patients with moderate or severe asthma treated with EH, TH or DKAH. The comparison between these three DPIs showed a significant trend favorable to EH when compared both versus TH and versus AH individually in specific satisfaction to inhaler, satisfaction with treatment, quality of life, and asthma control [21] (see Supplementary file 3), without significant differences in other variables. However, because of non-systematic recruitment in the ASCONA registry, DPI groups were heterogeneous (in size and clinical profile) and therefore not directly comparable. For instance, percentage

of patients with moderate asthma was higher in the EH group ( $p < 0.001$ ). Therefore, we decided to perform a *post-hoc* analysis using two randomized paired samples of patients matched according to age, gender and asthma severity, and treated with EH or with TH/DKAH. To explore whether this EH differences were relevant or not, we created homogeneous groups using paired matched samples approach, which will provide enough statistical power by unifying comparator groups (TH and AH) only under the assumption that they differ in a similar degree on the EH results.

## 2.1. Statistical analysis

Statistical analysis was performed with SPSS version 22.0 (SPSS Inc., Chicago, IL, USA). All statistical tests, tables and charts considered only the numbers of valid cases.

Categorical variables were described with number of valid cases and percentage, whereas mean and standard deviation (SD) were used for continuous variables. Dichotomous variables were created for each variable of interest using the median of the scores from the questionnaires and scales (FSI-10, TSQM, TAI and Mini-AQLQ) or a pre-established cut-off point (ACT [22] and Morisky-Green scale [13]).

Statistical tests included one-way analysis of variance (ANOVA) for group comparisons, Mann-Whitney test or Kruskal-Wallis test for continuous variables, and  $\chi^2$  test for categorical variables. Pearson and Spearman correlation tests were used to assess relationships between scale scores. Finally, multivariate analyses were performed to examine factors that influenced the study dependent variable (specific satisfaction with inhaler according to FSI-10).

## 3. Results

We included a group of patients treated with EH ( $n = 164$ ) and a second group of patients treated with TH ( $n = 100$ ) or DKAH ( $n = 64$ ). Data were paired by gender, age, and asthma severity (Table 1). There were no statistically significant differences between groups in the forced expiratory volume in one second (FEV<sub>1</sub>) test ( $p = 0.443$ ); daytime asthma symptoms more than twice/week ( $p = 0.664$ );

Table 1. Characteristics of study patients.

Variable	Easyhaler™ ( $n = 164$ )	Turbuhaler™/ Diskus™ (Accuhaler™) ( $n = 164$ )	p
	N (%) or mean $\pm$ SD	N (%) or mean $\pm$ SD	
Socio-demographic and clinical data			
Age (y)	48.9 (16.16)	47.6 (15.9)	ns
Gender (female)	104 (63.4)	104 (63.4)	1
Age at asthma diagnosis (y)	32.7 $\pm$ 18.6	29.6 $\pm$ 18.8	ns
Age at onset of asthma therapy (y)	34,34 $\pm$ 18,18	31,4 $\pm$ 18,3	ns
Asthma severity (GINA)			1
Moderate	120 (73.2)	120 (73.2)	
Severe	44 (26.8)	44 (26.8)	

ns, non-statistically significant; GINA, Global Initiative for Asthma.

165 night waking due to asthma ( $p = 0.861$ ); need for rescue  
medication ( $p = 0.975$ ); and activity limitation due to  
170 asthma ( $p = 0.823$ ). No prior or current medication affected  
satisfaction with inhaler.

Table 2 shows the differences between groups in terms  
of patient satisfaction and adherence. Specific satisfaction  
with the inhaler (global score of FSI-10) was statistically  
significantly higher with EH compared with TH/DKAH  
( $p < 0.01$ ). With regard to individual FSI-10 items, patients  
175 considered EH to be easier to learn to use ( $p = 0.025$ ),  
easier to prepare for inhalation ( $p = 0.01$ ), easier to use  
( $p = 0.012$ ), and easier to carry ( $p = 0.018$ ). Patients found  
EH easier to continue with regular activities ( $p = 0.038$ ),  
and its weight and size were more convenient ( $p < 0.001$ ).  
180 In addition, = they felt they had used it correctly after  
inhalation ( $p = 0.02$ ). Overall, patients noted greater satis-  
faction with the device ( $p = 0.001$ ). No statistically signifi-  
cant difference was found for device cleaning and  
maintenance, or for mouthpiece comfort. Moreover, the  
percentage of patients with high satisfaction with inhaler  
185 was statistically significantly higher with EH ( $p = 0.01$ ).

Regarding general satisfaction with therapy (TSQM),  
there were no statistically significant differences in global  
scores between DPIs. However, patients in EH group  
reported that it was easier to take their medication in its  
190 current form ( $p = 0.018$ ) and to plan when they will use  
the medication each time ( $p = 0.004$ ). Patients using EH  
also found it more convenient to take the medication as  
instructed ( $p = 0.042$ ). Furthermore, all items of adverse  
event subscale showed a trend to be lower for EH group,  
195 but without statistical significance; this result is based on  
questionnaire answers, not on patient-reported adverse  
events of administered drugs. Moreover, convenience  
was statistically significantly higher in EH group

( $p < 0.01$ ). In addition, the percentage of patients with  
high satisfaction with treatment was statistically signifi- 200  
cantly higher in the EH group ( $p = 0.027$ ).

In respect of specific adherence to inhaler (TAI), there was  
no statistically significant difference in TAI global scores  
between groups. Nevertheless, mean scores of erratic and  
unwitting non-adherence patterns were higher in the EH 205  
group ( $p < 0.05$  for both patterns), reflecting that these non-  
adherence patterns were less frequent with EH. There was no  
statistically significant difference between groups for general  
adherence in global scores of the Morisky–Green scale.

With regard to asthma control, there was no statistically 210  
significant difference in ACT global score or in the percentage  
of patients with controlled asthma (ACT score  $\geq 20$ ). Finally,  
there was no statistically significant difference in health-  
related quality of life (Mini-AQLQ).

We performed a logistic regression analysis with specific 215  
satisfaction with inhaler (FSI-10) as a dependent variable  
(Figure 1). The most important factor leading to high satisfac-  
tion was the use of EH (odds ratio [OR] 1.705; 95% CI  
1.056–2.755). Moreover, male gender slightly inclined towards  
high satisfaction with inhaler (OR 1.245; 95% CI 0.756–2.051). 220  
Conversely, factors that led to low satisfaction with inhaler  
were severe asthma (OR 1.186; 95% CI 0.663–2.120) and non-  
controlled asthma (OR 0.390; 95% CI 0.236–0.643).

#### 4. Discussion

In our real-world study, patient satisfaction with inhaler was 225  
higher with EH than with TH/DKAH. Among other features,  
ease of use, convenient weight and size, and ease of portabil-  
ity contributed to higher satisfaction with EH. These results  
confirm the findings in the whole ASCONA population, where  
patient satisfaction was also higher with EH than with TH or 230  
DKAH [9]. Moreover, although the aim of our study was not to  
prove the clinical relevance of differences in FSI-10 score,  
results of ASCONA main analysis [9] showed that these differ-  
ences are clinically relevant.

The preference for EH has been found in other studies in 235  
patients with asthma. Ahonen et al. [23] performed a meta-  
analysis of nine clinical trials ( $n = 802$ ) of EH and metered-  
dose inhalers (MDIs) with and without a spacer, TH, and  
Diskhaler™ in patients with asthma. Ease of use was statisti-  
cally significantly better for EH vs. the pooled data 240  
( $p < 0.001$ ) and for almost all individual studies. Inhalation  
through the device was also easier with EH, as was learning  
how to use it. Patients preferred EH to the MDI and spacer  
( $p < 0.001$ ) and to TH ( $p < 0.01$ ) [23]. Preference of patients  
for EH has also been shown in other randomized clinical 245  
trials in patients with asthma. Jäger et al. [24] compared EH  
and TH; almost 59% of patients preferred EH and scores of  
device acceptability were higher for EH ( $p = 0.001$ ).  
Similarly, in a study by Tukiainen et al. [25] again 59% of  
patients preferred EH vs. TH. Moreover, overall acceptability 250  
was higher for EH ( $p < 0.0001$ ). In a study by Giner et al. [8],  
nine aspects of the inhalers were rated from 0 to 10 for  
each device. The overall score was higher for EH vs. TH  
( $p = 0.015$ ) and vs. DKAH ( $p = 0.003$ ). When patients were  
asked to rank the inhalers in order of preference, EH was 255

Table 2. Comparison of questionnaire results between groups.

Variable	Easyhaler™ (n = 164)	Turbuhaler™/ Diskus™ (Accuhaler™) (n = 164)	p
	N (%) or mean $\pm$ SD	N (%) or mean $\pm$ SD	
Specific satisfaction with inhaler (FSI-10)			
FSI-10 score	43.8 $\pm$ 7.1	41.3 $\pm$ 7.6	< 0.01
High satisfaction (score $\geq 43$ )	92 (62.4)	68 (43)	0.01
General satisfaction with medication (TSQM)			
Effectiveness	71.4 $\pm$ 20.6	70.9 $\pm$ 18.4	ns
Adverse events	97.1 $\pm$ 9.7	94.1 $\pm$ 14.3	< 0.05
Convenience	79.7 $\pm$ 14.2	75.75 $\pm$ 16.1	< 0.01
Global satisfaction	74.6 $\pm$ 16.1	72.3 $\pm$ 17.7	ns
High global satisfaction (score $\geq 75$ )	102 (63.4)	84 (51.2)	< 0.05
Adherence			
TAI			
Score	47.1 $\pm$ 4.4	46.4 $\pm$ 5.1	ns
Good adherence (score $\geq 50$ )	64 (40.8)	59 (37.1)	ns
Non-adherence pattern			
Erratic	23.1 $\pm$ 2.7	22.4 $\pm$ 3.4	< 0.05
Deliberate	24.1 $\pm$ 2.2	24.24 $\pm$ 2.2	ns
Unwitting	3.9 $\pm$ 0.4	3.8 $\pm$ 0.4	< 0.05
Morisky–Green scale			
Score	3.1 $\pm$ 1.1	2.9 $\pm$ 1.1	ns
Good adherence (score = 4)	75 (45.1)	59 (36.0)	ns

ns, non-statistically significant; FSI-10, Feeling of Satisfaction with Inhaler questionnaire; TSQM, Treatment Satisfaction Questionnaire for Medication; TAI, Test of the Adherence to Inhalers.

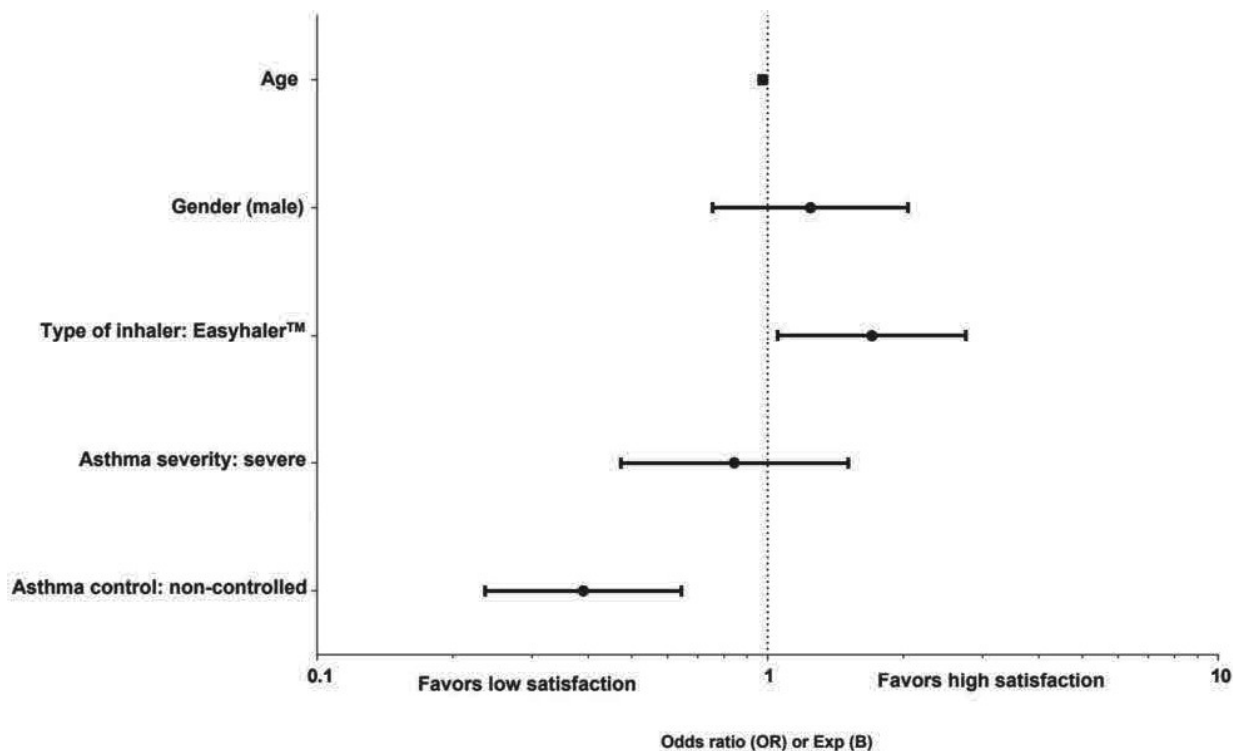


Figure 1. Binary logistic regression analysis using specific satisfaction with inhaler (FSI-10) as dependent variable. Use of Easyhaler™ led to high specific satisfaction with inhaler.

placed first by 53% of patients, TH by 27% and DKAH by 20%. In two real-world multicenter studies by Gálffy et al. [26], patients considered that EH was easy to learn and use, and 95% were satisfied or very satisfied with this inhaler.

260 Erratic and unwitting non-adherence patterns were less frequent in patients using EH. With respect to erratic non-adherence, we could not find a direct relationship between forgetting to take the dose and the different inhaler devices. Regarding the lower unwitting non-adherence with EH, we suggest that it was due to its ease of use, with only three steps and therefore fewer technical errors. There were no statistically significant differences between groups in terms of global adherence scores. Similarly, asthma control was comparable in both groups. A relationship between satisfaction and adherence has been found in other studies [3,27], but these did not compare different inhalers. In the main analysis of ASCONA, high patient satisfaction with inhaler was related to adherence and asthma control [9]. However, because of the sample size in our subanalysis, the difference in satisfaction was insufficient to be reflected in adherence and asthma control.

280 The main strengths of our study are the population homogeneity and the use of validated and specific scales and questionnaires. Regarding potential limitations, adherence was self-reported except for items 11 and 12 of TAI. However, these two physician-reported items define the unwitting non-adherence pattern. Another potential limitation could be that different drug combinations may affect results.

## 5. Conclusions

Physicians should keep in mind patient satisfaction with asthma therapy, and especially specific satisfaction with the inhaler. In this setting, EH is well valued by patients. In our homogeneous population of patients with moderate to severe asthma, specific satisfaction with the inhaler was higher with EH.

However, the relationship between satisfaction with the inhaler and adherence and asthma control deserves more investigation.

## Key issues

- Physicians should keep in mind patient satisfaction with asthma therapy, and especially specific satisfaction with the inhaler.
- Dry powder inhalers (DPIs) present different features that may have clinical implications.
- Easyhaler™ has been shown to have advantages over older DPIs in prior studies.
- In a homogeneous population of patients with moderate to severe asthma, specific satisfaction with inhaler (measured with the FSI-10 questionnaire) was statistically significantly higher with Easyhaler™ ( $43.8 \pm 7.1$ ) compared with Turbuhaler™ or Diskus™ (Accuhaler™) ( $41.3 \pm 7.6$ ) ( $p < 0.01$ ).
- Moreover, high satisfaction with inhaler was statistically significantly higher with Easyhaler™ (62.4% of patients) than with Turbuhaler™ or Diskus™ (Accuhaler™) (43% of patients) ( $p = 0.01$ ).

- This preference for EH has been found in other studies in patients with asthma.

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## Author contribution

All authors have contributed significantly to conception, design and execution of the study. All authors have participated in drafting, reviewing, and/or revising the manuscript, and have approved its submission.

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## Declaration of interest

A.V. has previously received honoraria for speaking at sponsored meetings from AstraZeneca, Chiesi and Novartis, and is a consultant for AstraZeneca and Sanofi.

L.M. has participated in advisory and training activities for Zambon, Esteve and Orion Pharma.

M.C. has received speaker fees from Boehringer Ingelheim, AstraZeneca, GlaxoSmithKline, Menarini, and Novartis, and has received consulting fees from GlaxoSmithKline, Gebro Pharma and Novartis.

C.C. and P.R. are both employed by Orion Pharma.

V.P. previously received honoraria for speaking at sponsored meetings from AstraZeneca, Chiesi, GlaxoSmithKline and Novartis. They also received assistance in traveling to meetings from Chiesi and Novartis. They act as a consultant for ALK, AstraZeneca, Boehringer, MundiPharma and Sanofi. They have also received funding/grant support for research projects from a variety of government agencies and not-for-profit foundations, as well as AstraZeneca, Chiesi and Menarini.

The authors have no other relevant affiliations or financial involvement with any organization or entity with a financial interest in or financial conflict with the subject matter or materials discussed in the manuscript apart from those disclosed.

## Reviewers Disclosure

Peer reviewers on this manuscript have no relevant financial relationships or otherwise to disclose.

## References

Papers of special note have been highlighted as either of interest (\*) or of considerable interest (\*\*) to readers.

- Wilson SR, Strub P, Buist AS, et al. Shared treatment decision making improves adherence and outcomes in poorly controlled asthma. *Am J Respir Crit Care Med*. 2010;181:566–577.
- Global Initiative for Asthma. *Global Strategy for Asthma Management and Prevention* [Internet]. 2018. [cited 2018 Jun 15]. Available from: <http://ginasthma.org/2018-gina-report-global-strategy-for-asthma-management-and-prevention/>
- Price D, Harrow B, Small M, et al. Establishing the relationship of inhaler satisfaction, treatment adherence, and patient outcomes: a prospective, real-world, cross-sectional survey of US adult asthma patients and physicians. *World Allergy Organ J*. 2015;8:1–11.

- Lavorini F, Levy ML, Dekhuijzen PR, et al. Inhaler choice and inhalation technique: key factors for asthma control. *Prim Care Respir J*. 2009;18:241–242.
- Chrystyn H, Price D. Not all asthma inhalers are the same: factors to consider when prescribing an inhaler. *Prim Care Respir J*. 2009;18:243–249.
- Chrystyn H. Closer to an “Ideal Inhaler” with the Easyhaler®. *Clin Drug Investig*. 2006;26:175–183.
- Haikarainen J, Ryttilä P, Roos S, et al. Dose uniformity of budesonide Easyhaler® under simulated real-life conditions and with low inspiration flow rates. *Chron Respir Dis*. 2017;1479972317745733.
- Giner J, Torrejón M, Ramos A, et al. Patient preference in the choice of dry powder inhalers. *Arch Bronconeumol*. 2004;40:106–109.
- Plaza V, Giner J, Calle M, et al. Impact of patient satisfaction with his or her inhaler on adherence and asthma control. *Allergy Asthma Proc*. 2018;39:437–444.
- It includes the method used in ASCONA study.**
- Perpiñá Tordera M, Viejo JL, Sanchis J, et al. [Assessment of patient satisfaction and preferences with inhalers in asthma with the FSI-10 Questionnaire]. *Arch Bronconeumol*. 2008;44:346–352.
- This paper defines the measurement properties of the FSI-10 questionnaire.**
- Atkinson MJ, Sinha A, Hass SL, et al. Validation of a general measure of treatment satisfaction, the treatment satisfaction questionnaire for medication (TSQM), using a national panel study of chronic disease. *Health Qual Life Outcomes*. 2004;2:12.
- Plaza V, Fernández-Rodríguez C, Melero C, et al. Validation of the “Test of the Adherence to Inhalers” (TAI) for asthma and COPD patients. *J Aerosol Med Pulm Drug Deliv*. 2016;29:142–152.
- Morisky DE, Green LW, Levine DM. Concurrent and predictive validity of a self-reported measure of medication adherence. *Med Care*. 1986;24:67–74.
- Nathan RA, Sorkness CA, Kosinski M, et al. Development of the asthma control test: a survey for assessing asthma control. *J Allergy Clin Immunol*. 2004;113:59–65.
- Juniper EF, Buist AS, Cox FM, et al. Validation of a standardized version of the asthma quality of life questionnaire. *Chest*. 1999;115:1265–1270.
- Juniper EF, Guyatt GH, Cox FM, et al. Development and validation of the mini asthma quality of life questionnaire. *Eur Respir J*. 1999;14:1044–1048.
- Trujols J, Iraurgi I, Siñol N, et al. Satisfaction with methadone as a medication: psychometric properties of the Spanish version of the treatment satisfaction questionnaire for medication. *J Clin Psychopharmacol*. 2012;32:69–74.
- Val Jiménez A, Amorós Ballester G, Martínez Visa P, et al. [Descriptive study of patient compliance in pharmacologic antihypertensive treatment and validation of the morisky and green test]. *Aten Primaria*. 1992;10:767–770.
- Vega JM, Badia X, Badiola C, et al. Validation of the Spanish version of the Asthma Control Test (ACT). *J Asthma*. 2007;44:867–872.
- Sanjuás C, Alonso J, Ferrer M, et al. Adaptation of the asthma quality of life questionnaire to a second language preserves its critical properties: the Spanish version. *J Clin Epidemiol*. 2001;54:182–189.
- Valero A, Ribo P, Giner J, et al. Ease of use of inhalers and its impact on treatment adherence and control of asthma. An observational study. *Allergy*. 2017;72(S103):419.
- Thomas M, Kay S, Pike J, et al. The Asthma Control Test™ (ACT) as a predictor of GINA guideline-defined asthma control: analysis of a multinational cross-sectional survey. *Prim Care Respir J*. 2009;18:41–49.
- Ahonen A, Leinonen M, Ranki-Pesonen M. Patient satisfaction with Easyhaler® compared with other inhalation systems in the treatment of asthma: a meta-analysis. *Curr Ther Res*. 2000;61:61–73.
- Jäger L, Laurikainen K, Leinonen M, et al. Beclomethasone dipropionate Easyhaler is as effective as budesonide Turbohaler in the control of asthma and is preferred by patients. German study group. *Int J Clin Pract*. 2000;54:368–372.

25. Tukiainen H, Ryttilä P, Hämäläinen K, et al. Safety, tolerability and acceptability of two dry powder inhalers in the administration of budesonide in steroid-treated asthmatic patients. *Respir Med.* 2002;96:221–229.
26. Gálffy G, Mezei G, Németh G, et al. Inhaler competence and patient satisfaction with Easyhaler®: results of two real-life multi-centre studies in asthma and COPD. *Drugs R D.* 2013;13:215–222.

- **Patients with asthma found Easyhaler™ easy to use and they had high satisfaction with the device.**
27. Small M, Anderson P, Vickers A, et al. Importance of inhaler-device satisfaction in asthma treatment: real-world observations of physician-observed compliance and clinical/patient-reported outcomes. *Adv Ther.* 2011;28:202–212.