

Acceptance of the Accuhaler, a Multi-dose Powder Inhaler, among Asthmatic Patients: A Comparison with the Pressurized Metered-Dose Inhaler

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Since its introduction in the mid-1950s, the pressurized metered-dose inhaler (pMDI) has become the most frequently prescribed inhalation device for asthma treatment.¹ However, some patients have difficulty in using a pMDI correctly because of the poor coordination of inspiration with inhaler actuation.²⁻⁴ Such difficulties can be overcome by the use of a spacer device or breath-actuated inhalers.^{5,6} Powder inhalers were introduced as an alternative to the pMDI for patients who experience difficulty in coordinating inspiration with actuation. As powder inhalers are breath-activated, minimal coordination is needed.

The Accuhaler™ (Glaxo-Wellcome, U.K.) is a multidose powder inhaler designed with low resistance to airflow and to allow accurate and consistent dosing with moisture protection.⁷ An integral cover protects the mouthpiece and inner workings from contamination or damage, and a dose counter indicates the exact number of doses remaining in the device. The device contains one month's therapy in 60

SUMMARY This study aimed to evaluate dry powder inhaler naïve asthmatic patients' perception and preference of the Accuhaler™, a multidose dry powder inhaler and the pressurized metered dose inhaler (pMDI). After the first instruction, 66.7% of 48 patients enrolled in the study could demonstrate the correct use of the Accuhaler™. When the patients were asked to compare the pMDI and the Accuhaler™ after using the Accuhaler to administer salmeterol for 4 weeks, the Accuhaler™ scored significantly better than the pMDI for the following features: knowing how many doses are left, presence of an attached cover, taste, instruction for use, attractiveness, ease of use, ease of holding, shape, and comfortable mouthpiece. The pMDI scored better to the Accuhaler™ in terms of size. More patients preferred the Accuhaler™ than the pMDI; the presence of a dose counter and perceived ease of use were the main reasons cited for their preference for the Accuhaler™.

doses of the medication in individually sealed blisters. The Accuhaler™ has been shown to consistently deliver doses of drug throughout the life of the device and across a range of flow.⁷ The device is operated in four easy steps: the mouthpiece cover is opened; the dosing lever is pulled back to advance the next dose ready to be taken; the patient breathes in slowly; and then the mouthpiece cover is closed to reset the device for the next dose.

The aims of this study were: 1) to investigate the opinions of asthmatic patients aged 12 years

and above who had never used dry powder inhalers on their pMDI, 2) to identify asthmatic patients' perception of an ideal inhaler device, and 3) to assess their acceptance of the Accuhaler™.

METHODS

Inclusion criteria

The study was an open design of 4 weeks' duration. Study

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subjects included patients aged 12 years and above with stable chronic asthma attending the Asthma Clinic of the University of Malaya Medical Centre, Kuala Lumpur who required regular inhaled short-acting β_2 -agonists in addition to regular inhaled corticosteroids. The patients must have used a pMDI aerosol for at least three months, without having previously used a dry powder device. The study was approved by the hospital ethics committee and all patients or their parents (for those below the age of 18 years) gave informed consent prior to being interviewed and enrolled in the study.

The interview

Using a questionnaire standardized for this study, each patient was interviewed to record the following information: 1) Basic demographic details including patients' occupation, level of education, asthma history and type of asthma medication used, 2) Patients' attitudes to the pMDI that they were currently using, both spontaneously and with the help of a given list of features which included ease of use during an asthma attack, weight, ease of carrying around, size, ease of holding, discreetness, overall ease of use, and knowing how many doses are left, 3) Patients were asked to describe the features of their 'ideal' inhaler device, and then to select the 10 most important features from a prompted list (Table 1) and 4) Each patient was then given an AccuhalerTM device containing salmeterol 50 μ g per dose. The patient was instructed once by one of the investigators (CKL) on how to use the device. Then the patient's ability to correctly perform each of the steps necessary for device use was assessed, i.e. 1) open the mouth-

piece cover, 2) slide the dosing lever, 3) inhale medication and 4) close mouthpiece cover. If the patient demonstrated any difficulty, additional instruction was given to ensure correct usage of the device.

Treatment using the test device

The patients were asked to use salmeterol 50 μ g twice daily from the AccuhalerTM for 4 weeks instead of their usual inhaled short-acting β_2 -agonists from pMDIs on a regular basis during this period and to return to the clinic at the end of the 4-week treatment period. The patients were allowed to use short-acting inhaled β_2 -agonists as required to treat any breakthrough symptoms.

Preference for AccuhalerTM or pressurized metered dose inhaler

When the patients returned to the clinic at the end of the 4-week treatment period, they were interviewed a second time. They were asked to state if they had a preference or no preference, for either the pMDI or the AccuhalerTM with respect to 14 specific inhaler

features (Table 2) and also to state the overall preference for either inhaler device and the reason(s) for the preference.

Statistical analysis

Unpaired *t*-test was used to examine the effect of age on the patients' preference of the inhaler devices. The chi-square test or Fisher's exact test was employed to assess the association between categorical variables. The chi-square test was used to compare each device with the other. SPSS for Windows (SPSS Inc., Chicago, Ill, U.S.A.) was used to calculate the statistics. A two-tailed *p* value < 0.05 was considered statistically significant.

RESULTS

Patient characteristics

A total of 48 asthmatic patients with a mean age of 45.9 (\pm 13.7) years (range 12 to 66 years) were recruited. Apart from two patients who were 12 years old, the rest of the patients were 19 years of age and above. There were 12 male and 36 female patients. The patients'

Table 1 Prompted list of features judged to be important in an ideal inhaler device

- Small size
- Ease of use
- Ease of use during an asthma attack
- Ease of holding/gripping
- Discreetness
- Dose counter
- Comfortable mouthpiece
- Light weight
- Can feel dose has been taken
- Attached cover/cannot lose it
- Ease of carrying around

occupation, level of education, duration of asthma, asthma severity, duration of pMDI usage and frequency of asthma symptoms while on their current treatment are shown in Table 3. The majority of patients (72.9%) had had asthma for more than 10 years. All patients were current users of a pMDI; 85.4% of them had used it for more than one year. All the patients were on inhaled corticosteroids, either beclomethasone dipropionate or budesonide, at doses of at least 800 µg a day. All of them were using inhaled short-acting β₂-agonist regularly for symptom relief. In addition, five patients were on regular ipratropium bromide. With their current treatment, 64.6% of the patients still had asthma symptoms more than once a week.

Attitudes to current pMDI

The patients found their current pMDI easy (43.8%) or very

easy (56.2%) to handle. The main advantages of the pMDI identified spontaneously included effectiveness in delivering the drug (77.1%) and ease of carrying around (14.6%). Specific features of the pMDI that

patients were satisfied with from a prompted list are shown in Table 4. Very few patients were satisfied with knowing how many doses are left in the pMDI.

Table 2 Features for comparison between the pressurized metered-dose inhaler (pMDI) and the Accuhaler™

- Instruction for use
- Ease of carrying around
- Ease of use
- Ease of holding/gripping
- Size
- Attached cover
- Knowing how many doses are left
- Overall attractiveness
- Shape
- Comfortable mouthpiece
- Weight
- Discreetness
- Ability to feel dose taken
- Taste

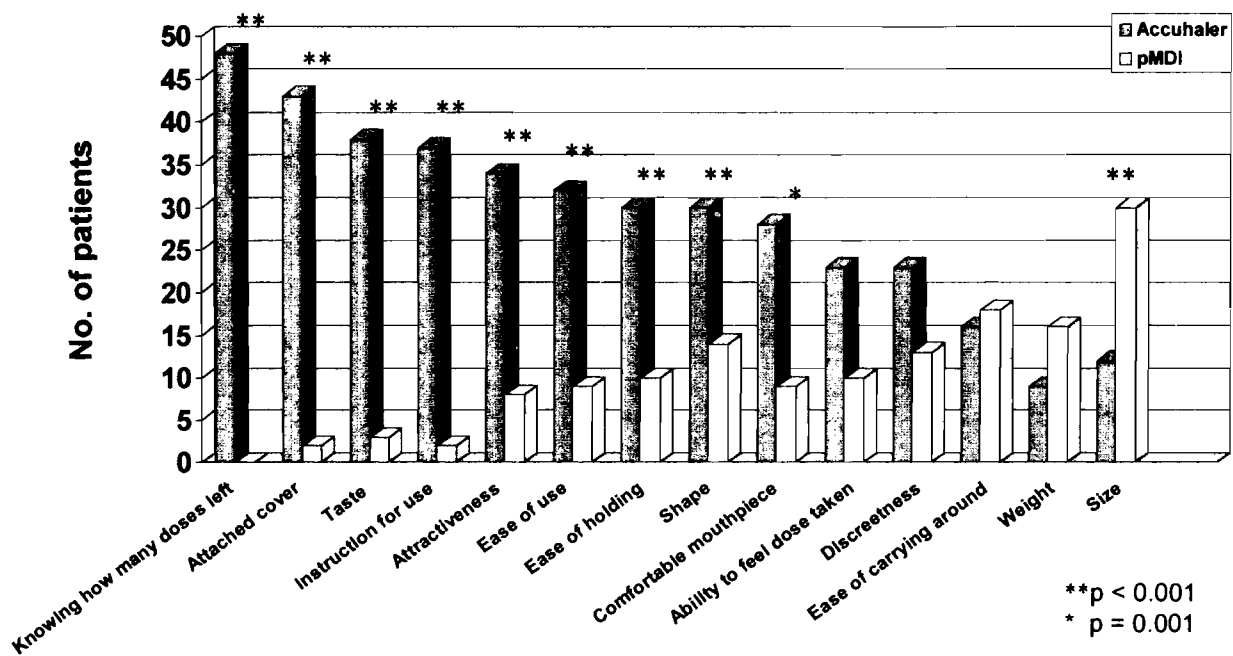


Fig. 1 Patient preference for Accuhaler™ compared with pMDI.

Table 3 Patient characteristics

	Patients (n = 48)	
	n	%
Occupation		
Housewife	15	31.3
Clerk	8	16.7
Blue collar worker	7	14.6
Teacher	4	8.3
Professional	4	8.3
Retired	5	10.4
Nurse	3	6.3
Student	2	4.2
Level of education		
No formal education	0	0
Completed primary school	4	8.2
Completed secondary school	35	71.4
College/university graduate	9	18.4
Duration of asthma		
Less than 1 year	0	0
1 - 5 years	7	14.6
6 - 10 years	6	12.5
More than 10 years	35	72.9
Severity of chronic asthma		
Moderate	19	39.6
Severe	29	60.4
Duration of pressurized metered-dose inhaler usage		
3 - 6 months	6	12.5
7 - 12 months	1	2.1
1 - 5 years	25	52.1
more than 5 years	16	33.3
Frequency of asthma symptoms while on regular treatment		
Every day	5	10.4
Every night	6	12.5
Every day and every night	5	10.4
More than once a week	15	31.3
Once a week or less	17	35.4

The most important features of Comparison of Accuhaler™ and an ideal inhaler device pMDI

Table 5 gives the 10 features from the prompted list judged by the patients to be the most important in an ideal inhaler device. The presence of a dose counter and ease of use were regarded as the most important features.

Following a demonstration by the investigator, 32 (66.7%) patients were able to perform all the steps correctly on their first attempt to use the Accuhaler™. Among those experiencing problems with the Accuhaler™, difficulties were

noted in six patients (12.5%) in opening the device, 10 patients (20.8%) in sliding the dosing lever, five patients (10.4%) in inhaling the dose, and six patients (12.5%) in closing the device.

Fig. 1 presents the patients' preference if any for the pMDI or the Accuhaler™ on specific features. The Accuhaler™ scored significantly better ($p < 0.001$) than the pMDI for the following features: knowing how many doses are left, presence of an attached cover, instruction for use, taste, attractiveness, ease of use, ease of holding, shape, and comfortable mouthpiece ($p = 0.001$). The pMDI scored significantly better than the Accuhaler™ in terms of size ($p < 0.001$). There was no significant difference between the Accuhaler™ and pMDI with respect to weight, discreetness, ease of carrying around and the ability to feel when the dose has been taken. Overall, 70.8% of the patients preferred the Accuhaler™ while 29.2% preferred pMDI ($p = 0.004$). The presence of a dose counter and perceived ease of use were the main reasons cited for preference for the Accuhaler™.

Preference for the Accuhaler™ was not related to the patients' age, gender, educational level, occupation or duration of using the pMDI. All patients with asthma for 10 years or less preferred the Accuhaler™ while for patients whose asthma was longer, 14 of 35 patients preferred the pMDI ($p = 0.026$) (Table 6).

DISCUSSION

This study has shown that the Accuhaler™ is well liked by asthmatic patients and compares favourably with the well established pMDI. Although all the patients

Table 4 Satisfaction with features of currently used pressurized metered-dose inhaler (from a prompted list)

Feature	Percent of patients satisfied (n = 48)
Ease of use during an asthma attack	64.5
Weight	77.1
Ease of carrying around	75.0
Size	64.6
Ease of holding/gripping	83.3
Discreetness	35.4
Overall ease of use	72.9
Knowing how many doses are left	6.3

Table 5 Ten features judged to be most important in an ideal inhaler device (from a prompted list)

Feature	Percentage of patients choosing feature (n = 48)
Dose counter	81.2
Ease of use during an asthma attack	79.2
Ease of use	77.1
Small size	70.8
Ease of carrying around	62.5
Comfortable mouthpiece	56.3
Ease of holding/gripping	54.2
Can feel dose has been taken	54.2
Compact shape	45.8
Pleasant taste	45.8

Table 6 Patient preference for inhaler device according to duration of asthma

Duration of asthma (yrs)	No. of patients preferring device	
	Pressurized MDI	Accuhaler™
1 - 5	0	7
6 - 10	0	6
> 10	14	21
Total	14	34

were experienced users of the pMDI, the majority preferred the novel Accuhaler™ regardless of age, gender, educational level, or duration of using the pMDI. Our results are in agreement with earlier studies which demonstrated the Accuhaler™ to be a more preferred inhaler device than the pMDI.^{8,9}

Similar to the findings of another study,⁸ our asthmatic patients in this study who were regular and experienced users of the pMDI were well satisfied with the device, finding it easy or very easy to handle. They were satisfied with a number of its features including its ease of holding, weight, and ease of carrying around. However, more than 20% of patients found operation of the device a disadvantage of the pMDI. Previous studies have also demonstrated that some asthmatic patients have difficulty in using the pMDI.^{3,7,8} When compared with the Accuhaler™ the pMDI was only preferred by our patients who had asthma for more than 10 years. The reason for this is unclear as their preference for one device or the other was not influenced by the duration of pMDI usage.

In this study, the Accuhaler™ scored significantly better than the pMDI with respect to overall preference and specific features. The presence of a dose counter and ease of use were regarded as the most important features of an ideal inhaler among the patients and these attributes of the Accuhaler™ were the main reasons that influenced the patients' overall preference for this device. Knowing how many doses of medication are left in the inhaler device is also cited as one of the most important features of an ideal inhaler device in another study⁹ which also demonstrated that

the Accuhaler™ scored significantly better than the Turbuhaler, an older multi-dose powder inhaler without a dose counter, with respect to this feature. The presence of a dose-counting facility and using a patient's preferred treatment may increase patient compliance.¹⁰⁻¹²

Handling and clinical studies have shown that the Accuhaler™ used to deliver either salmeterol or fluticasone is easy to use and well liked by patients across all age groups.^{9,13,14} In a patient preference survey, comparing the Accuhaler™ and Turbuhaler, the Accuhaler™ was rated higher on most characteristics, particularly ease of use, the presence of a dose counter and an integral cover.⁸ High humidity may alter the physical characteristics of powder in the reservoir in an improperly closed Turbuhaler and the amount of drug delivered may be affected.¹⁵ In contrast, the Accuhaler™ contains the medication in individually sealed blisters which offer moisture protection. Recent pediatrics studies also showed that children preferred the Accuhaler™ over the Turbuhaler because the former is perceived to be easier to use.^{9,16}

Our patients' preference for the Accuhaler™ over the pMDI was further supported by the fact that they preferred its shape and attractiveness, found it easier to hold, felt it had a more comfortable mouthpiece, and its instruction for use which are easier to follow. However, the pMDI scored significantly better than the Accuhaler™ for size.

We conclude that the Accuhaler™ is well liked by asthmatic patients, particularly because of the presence of a dose counter and its perceived ease of use. It is important to take into account the personal opinion of the patients when selecting the most appropriate inhaler device. A well-liked inhaler device that is easy to use may improve patient compliance with inhaled asthma therapy and contribute to better asthma control.

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