

ORIGINAL ARTICLE

Ability to learn inhaler technique in relation to cognitive scores and tests of praxis in old age

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Clinical observations have shown that some older patients are unable to learn to use a metered dose inhaler (MDI) despite having a normal abbreviated mental test (AMT) score, possibly because of dyspraxia or unrecognised cognitive impairment. Thirty inhaler-naïve inpatients (age 76-94) with an AMT score of 8-10 (normal) were studied. Standard MDI training was given and the level of competence reached was scored (inhalation score). A separate observer performed the minimal mental test (MMT), Barthel index, geriatric depression score (GDS), ideational dyspraxia test (IDT), and ideomotor dyspraxia test (IMD). No correlative or threshold relationship was found between inhalation score and Barthel index, GDS, or IDT. However, a significant correlation was found between inhalation score and IMD ($r = 0.45$, $p = 0.039$) and MMT ($r = 0.48$, $p = 0.032$) and threshold effects emerged in that no subject with a MMT score of less than 23/30 had an inhalation score of 5/10 or more (adequate technique requires 6/10 or more), and all 17/18 with an inhalation score of 6/10 or more had an IMD of 14/20 or more.

The three patients with a MMT >22 and inhalation score <6 had abnormal IMD scores. Inability to learn an adequate inhaler technique in subjects with a normal AMT score appears to be due to unrecognised cognitive impairment or dyspraxia. The MMT is probably a more useful screening test than the AMT score in this context.

Inhaled therapy remains the most effective and important aspect of asthma maintenance treatment for patients of all ages.¹ Therapeutic benefit depends on sufficient deposition of drugs in the medium and small airways; this is largely determined by a competent inhaler technique^{2,3} and is true for inhalers of all designs and complexities. A large proportion of asthmatic patients receive their medication by metered dose inhaler (MDI), often in conjunction with a large volume spacer, the operation of which requires a degree of dexterity and coordination. Many older patients have been shown to have poor inhaler technique^{4,5}; this might be a factor contributing to the observation that death rates from asthma have not fallen in the older age group as they have in children and younger adults in England and Wales.⁶

Previous studies have shown that cognitive function is an important determinant of inhaler technique in elderly subjects in community surveys,⁴ in ability to acquire compe-

tent technique⁷ and retain it.⁸ It has also been observed that some individuals with a normal abbreviated mental test (AMT)⁹ score of >7/10, and who are neurologically intact on clinical examination, are nevertheless unable to master an adequate MDI technique despite adequate training and reinforcement.¹⁰ Possible reasons for this include undetected cognitive impairment and subclinical dyspraxia, both of which can be caused by early or mild dementing illnesses or fall within the spectrum of normal functional changes of the ageing brain.¹¹ The study reported herein was conducted to explore that hypothesis.

METHODS

Thirty inpatients on rehabilitation wards consented to take part in the study. To obtain as near a random sample as possible all patients meeting the study criteria were asked consecutively if they were willing to be included, until the required number was reached. All had stable, reproducible, AMT scores of 8-10 when tested four to seven days apart. None had previously used any form of inhaler. All were able to read newsprint, with or without glasses, and hear a voice at conversational level with or without a hearing aid.

Patients were excluded if there was evidence of focal neurological loss on clinical examination, a confusional state, or a painful condition of the hands.

All subjects were given standard MDI training using the National Asthma Campaign recommended method and the level of competence reached was scored on a scale of 0-10 by analogue judgment by an experienced observer, where 0 represented the worst possible technique, 10 a perfect technique, and the threshold for adequate competence²⁻⁴ was at 5/6 (5 just incompetent, 6 just competent). The scale is shown in table 1,

Table 1 The inhaler score. The score was made by observation by an experienced clinician instructed to utilise the whole scale and to treat the division between a score of 5 and 6 as the threshold for an adequate technique

Typical errors observed	Inhaler score
A perfect technique	10
Breath hold <5 seconds	9
No breath hold	8
Actuate inhaler slightly late in inspiration	7
Actuate late but well before full inspiration	6
Actuate too late/too early	5
Poor inspiratory effort with late/early actuation	4
Very poor coordination of inspiration/actuation	3
Failure to actuate or no inspiration	2
Little idea how to use inhaler	1
No idea what to do with the inhaler	0

Abbreviations: AMT, abbreviated mental test; GDS, geriatric depression score; IDT, ideational dyspraxia test; IMD, ideomotor dyspraxia test; MDI, metered dose inhaler; MMT, minimal mental test

Table 2 Correlation between inhaler score and the minimal test (MMT), ideomotor dyspraxia test (IMD), ideational dyspraxia test (IDT), Barthel index, and geriatric depression scale (GDS)

	r	p Value
Inhaler score v MMT	0.48	0.032
Inhaler score v IMD	0.45	0.039
Inhaler score v IDT	0.11	NS
Inhaler score v Barthel index	0.19	NS
Inhaler score v GDS	-0.23	NS

Table 3 Comparison of the inhaler score competence threshold (>5) with the minimal test (MMT) score at the >22 threshold, and the ideomotor dyspraxia test (IMD) at the >13 threshold

	Inhaler score		p Value
	<6	>5	
MMT <23	9	0	
MMT >22	3	18	<0.01
IMD <14	7	1	
IMD >13	5	17	<0.01

along with typical observations of technique. A separate observer performed the minimal test (MMT),¹¹ which is a test of global cognitive status, the Barthel index,¹² a score of performance in the activities of daily living, the geriatric depression scale (GDS),¹³ the ideational dyspraxia test (IDT),¹⁴ which tests the ability to describe the use of objects, and the ideomotor dyspraxia test (IMD),¹⁵ which tests the ability to demonstrate the use of objects.

Statistical analysis

Correlation coefficients were calculated using Excel software, and categorical data were tested for statistical significance with Fisher's test.

RESULTS

The results are summarised in tables 2 and 3. A significant correlation was found between inhalation score and IMD, and between inhalation score and MMT. Furthermore, a threshold effect emerged with MMT, in that no subject with a MMT of less than 23/30 had an inhalation score of 5/10 or more (6/10 or more required for a competent score), and all subjects with an inhalation score of 6/10 or more had an IMD score of 14/20 or more.

Three subjects with MMT scores of 23/30 or more had an inhalation score of less than 6/10; however, all had abnormal IMD scores. Therefore, all subjects with an unsatisfactory inhalation score after training had evidence of cognitive impairment or dyspraxia, or both. No correlative or threshold relationship was found between inhalation score and Barthel index, GDS, or IDT. Only two patients had GDS scores in the depression range, though these were not severe and both had inhalation scores of more than 5/10.

DISCUSSION

This study has shown that elderly inpatients who are unable to learn to use a MDI despite a normal AMT score do have evidence of cognitive impairment on testing with the MMT or are dyspraxic.

Learning points

- Elderly patients are often unable to learn to use a metered dose inhaler despite apparently normal cognitive function and no obvious dyspraxia.
- Unrecognised cognitive impairment and subclinical dyspraxia are important reasons for that difficulty.
- Patients with a minimal test score of less than 23/30 are unlikely to master a metered dose inhaler.
- Patients with an ideomotor dyspraxia score of less than 14/20 are also unlikely to learn to use a metered dose inhaler.
- Clinicians should take these factors into account when prescribing inhaler therapy for elderly patients.

The observed correlations between inhalation score and MMT or IMD are not of clinical value but do reinforce the contention that cognitive function and praxis are the main determinants of whether a patient will be able reliably to learn to use an inhaler device. Of course, the correlation shown between inhalation score and IMD is somewhat tautological since MDI technique is itself a manifestation of ideomotor function. The threshold effects demonstrated are of use in a clinical setting because they provide a means of identifying patients who are unlikely to cope with a self administered inhaler device. It is noteworthy that the threshold found for the MMT was 22, which is generally taken to indicate definite but mild impairment, with scores of 23–25 representing a borderline score. Similarly, the IMD threshold was 14, which is also close to the borderline score of 16 which is deemed to be the lower limit of normal. Of course, these are not hard and fast rules, and the overall clinical context needs to be taken into account; nevertheless, these factors add a further indication that the MMT and IMD might be useful as screening tests.

How might the findings help in practice? While the AMT remains a useful quick screening test for likelihood of being able to use inhaler devices, because an abnormal score is reliably associated with inadequate technique,⁷ there will be some patients with a normal AMT score who cannot use an MDI properly if the AMT score alone is relied upon for cognitive screening. Our findings suggest that the more sensitive MMT¹¹ might be a more suitable screening test in this context. Furthermore, because subclinical dyspraxia is a frequent finding in frail elderly patients, our results support the contention that if such patients require inhaled therapy they should be assessed with a test of praxis, such as the IMD, as well as the MMT before deciding to proceed with an inhaler device. These tests are not particularly time consuming; the MMT takes about five minutes and the IMD about three minutes. If the results are in the impaired range there is not likely to be a successful result if MDI training is attempted. This is consistent with previous work using the AMT and the MMT for MDIs and other complex devices in elderly subjects.^{7 8 16} An earlier study showed that some elderly subjects with borderline or slightly impaired AMT scores can learn to use less complex inhalers, such as the Turbohaler (Astra),^{17 18} therefore, further work needs to be conducted to determine whether the MMT and IMD can be used to determine the likelihood of successful acquisition of adequate technique with such inhalers.

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