

Technique training does not improve the ability of most patients to use pressurised Metered Dose Inhalers (pMDI)

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Introduction

Patients prescribed pressurised Metered Dose Inhalers (pMDIs) require training and skill to co-ordinate both activation of the inhaler and inhalation^[1]. All international asthma guidelines recommend that inhalers should be prescribed only after patients have received training in the use of the device and have demonstrated their ability to use it. In addition the British Thoracic Society/Scottish Intercollegiate Guideline Network (BTS/SIGN) guidelines^[2] recommend that patients should have their ability to use an inhaler device assessed by a competent health care professional as part of structured clinical review. Studies have demonstrated that many patients and health care professionals are unable to use their pMDI correctly,^[3,4,5] and that this may have a detrimental effect on asthma control^[4]. Age has also been shown to be a factor in a patient's ability to use their MDI correctly.^[5]

This service evaluation focussed on uncontrolled asthma patients, currently prescribed a pMDI, who were reviewed in nurse run clinics (between 01/04/08 and 30/06/08). The main aim was to assess their ability to use and if appropriate, to learn to use a pMDI using the Aerosol Inhalation Monitor (AIM, Vitalograph) which tests inspiratory flow, synchronisation and breath holding.

Method

The Enhanced Asthma Care Service (EACS since February 2006) is an independent nurse service sponsored by a pharmaceutical company, Teva UK Limited, which is offered to General Practices for patients with a confirmed diagnosis of asthma. To date a hundred practices caring for about half-a-million patients, including 30779 diagnosed asthmatics (prevalence 6.9%) have contacted the EACS service nurses. A detailed clinical assessment is provided by Magister Clinical Nurse Specialists trained at least to asthma diploma level in an atmosphere of complete confidentiality and ethical consideration.

The practices are informed of the service by visiting Teva UK Limited representatives. The Nurse Advisors then meet with the practice teams independently to discuss EACS and agree an asthma review service specification tailored to the needs of the practice.

Once the practice has agreed to accept the EACS programme, computer searches are carried out to identify and extract data including 77 pre-determined clinical parameters on patients coded with asthma, using dedicated general practice extraction software (MIQUEST).^[6]

Practices determine a proxy measure of control - the total number (4-6) of short-acting Beta-2-bronchodilators (SABA) prescribed in 12 months. This, together with the 77 pre-determined clinical parameters (including prescribing and healthcare utilisation data extracted using the miquest software) form the basis of detailed discussion with the practices. This is facilitated by using the data which was extracted, compiled into an excel spreadsheet format, and transferred from the practice

IT system using data stick or CD Rom to a laptop, used by the EACS nurse advisor to conduct a clinical assessment prior to building a Course of Action Report (COAR) for the GP to review. A list of patients is generated by the Nurse Advisor to discuss with the practice according to individual, practice agreed protocols to include details of patients who have not had a review in the past 12 months; current prescribing; adherence and non adherence to medical advice. The practice then instructs the nurse which patients they would like to focus upon and what actions they would like the nurse to take to identify a group of patients for invitation to a clinic review. Actions would typically include sending a postal symptom questionnaire (RCP 3 questions)^[2] to symptomatic patients, patients identified as uncontrolled determined by the number of SABA prescribed in the previous 12 months, and others identified by the practice.

Having identified a patient group, an invitation is sent to attend a nurse clinical review in a dedicated asthma clinic. The review is summarised on a clinic proforma.

As part of their review, all patients undergo inhaler technique assessment, recommended in the BTS/SIGN Guidelines, based on their current prescribed inhaler using a placebo device, In-check monitor and vitalograph Aerosol Inhalation Monitor machine.

All patients using pMDIs had at least two assessments using AIM. Inhaler technique education was provided after testing if appropriate.

Following clinic assessment, all patients were discussed in detail by the nurses with the GP who decided on their future management. Any changes were implemented by the nurses according to the agreed practice protocol.

All information processed was solely for the purpose of carrying out the service, and compiled fully with the Nursing & Midwifery Council (NMC) Code of Conduct (Nursing Staff)^[7] ABPI Code of Practice 2008^[8] Caldicott Principles^[9] and the Data Protection Act 1998.^[10]

All patient data which was burnt to disk, remained in the practice, along with any reports generated for discussion and review by the practice. In addition, an anonymised database containing extracted patient and clinic review process data was downloaded with permission of the practices in accordance with their respective policies, to a master database outside the practice for use in academic research. No patient identifiable information was removed from the practice. A final practice report of all activity carried out by the EACS programme is generated for discussion with and review by the practice.



TABLE 2:

There is an association between patients' step and whether they were invited to attend. χ^2 statistic 709.77, $p < 0.001$. Of patients who were not invited, a higher percentage were in steps 0 and 2 (69% and 62% respectively), while more patients in all the other steps (1, 3, 4 and 5) were in the invited group.

Patients Invited to attend		Not invited	Invited	Total
BT/SIGN Step	Step 0	225 (69%)	103 (31%)	328
	Step 1	372 (34%)	708 (66%)	1080
	Step 2	4094 (62%)	2518 (38%)	6612
	Step 3	1045 (39%)	1640 (61%)	2685
	Step 4	136 (33%)	275 (67%)	411
Step 5	82 (33%)	168 (67%)	250	
Total*		5954 (52%)	5412 (48%)	11366

(*These results relate to the available/evaluable computerized data, which was extracted from a number of computer systems. Hence the apparent discrepancy between these and the total numbers referred to above)

TABLE 3:

Patients prescribed pMDIs who were tested using AIM:

Test of Inhaler Technique using AIM (Vitalograph) Machine				
		First Test	Second Test	Third Test
N	Valid	1275	1207	528
	Missing	16	84	763

1092/1275 (85.6%) using pMDIs failed the first AIM test.

There was a statistically significant increase in the numbers of patients able to use their pMDIs correctly following instruction, after the second (129 to 260 of 1197 patients, $p < 0.01$) and third (61 to 181 of 528 patients, $p < 0.01$) tests. However 909/1197 (76%) and 323/528 (61%) of those tested twice and three times respectively, failed on these subsequent attempts, despite instruction. Over 54% and 60% failed the inspiratory flow criterion on second and third tests respectively. A Logistic regression failed to show any effect of age and BTS step on these outcomes.

The next two tables show the results of inhaler technique testing of those patients previously prescribed pMDIs. Comparisons of the first and second and first and third tests are shown where there are evaluable data for both of these pairs of patient groups.

TABLE 4:

Crosstabulation of AIM (Vitalograph) test : First versus second test ($p < 0.01$).

		Second Test of Inhaler Technique using AIM (Vitalograph) Machine		
		Fail	Pass	Total
First Test of Inhaler Technique using AIM (Vitalograph) Machine	Fail	909	159	1068
	Pass	28	101	129
Total		937	260	1197

TABLE 5:

Crosstabulation of AIM (Vitalograph) test : First versus third test ($p < 0.01$).

		Third Test of Inhaler Technique using AIM (Vitalograph) Machine		
		Fail	Pass	Total
First Test of Inhaler Technique using AIM (Vitalograph) Machine	Fail	335	132	467
	Pass	12	49	61
Total		347	181	528

For the purpose of this study the principle outcome was the results of inhaler technique testing, using the AIM machine. These data were analysed by comparing the success or failure of the test using crosstabulation and the χ^2 statistic. T test was used to determine the relationship between the number of inhalers prescribed and patients' clinic invitations.

Results

In these 100 practices there were 21647 patients (base population) on whom data was available.* The number of prescriptions in the previous 12 months for short acting bronchodilators per patient, ranged from zero to 108, with 50% being prescribed 4 or less inhalers for these drugs. 2123 of 8843 (24%) asthma patients chosen by participating practices for invitation, subsequently attended the EACS Clinics, according to the various inclusion criteria. 1291/2123 (61%) were using pMDIs and of these, over 80% were in BTS Steps 2 and 3. The attending patients mean age was 52 yrs (SD 21.37) slightly older than the base population (mean age 41 yrs, SD 22.82). From evaluable data,* invited patients ($n=5900$) and those not invited ($n=6356$) had been prescribed an average of 9.87 (SD 7.81) and 5.25 (SD 6.36) inhalers in the previous 12 months respectively. ($T=35.81$ $p < 0.001$).

(*Because of the different computer systems utilized by participating practices, and the fact there was incomplete data for certain parameters, it was not possible to analyse data for all patients).

TABLE 1:

Those patients invited to attend (available data) the clinics had been prescribed significantly more inhalers in the last 12 months. ($T=35.81$ $p < 0.001$)

Patients Invited to attend		N	Mean	Std. Deviation
Number of SABA in 12 mths	Invited	*5900	9.87	7.809
	Not invited	6356	5.25	6.358

(* Evaluable inhaler data only available in 5900 of the 8843 patients invited to attend the clinics)

Discussion

This service evaluation has confirmed findings from previous studies^[5,11] that despite education, significant numbers of patients cannot learn to use a pMDI effectively. The BTS guidelines recommend that if a patient is unable to use a pMDI an alternative device should be chosen.

The choice of device may be determined by the choice of drug however the National Institute for Clinical Excellence (NICE)^[12,13] is recommending that for adults and children over 12 years of age in whom treatment with an inhaled corticosteroid is appropriate, the least costly product that is suitable for an individual within its marketing authorisation should be used. Primary Care Trusts and Health Boards often recommend pMDI (+/- spacer) due to cost. (Anecdotal evidence). From our data, it is clear that the cheapest inhaler is not always the best for any one individual patient, especially if they cannot use it.

We were surprised to note the high number of pMDIs prescribed for some patients; a rigorous approach is needed by practices, to identify those patients receiving excessive inhalers. This could be done by refining systems for issuing repeat prescriptions.

It is of interest, from the EACS data, that there seems to be a shift in prescribing from lower to higher BTS/SIGN steps. The table below shows data from a previous publication by Neville *et al*^[14] comparing treatment steps in a population of 17206 adult asthma patients from 102 nationally distributed practices (1993/1994) with the EACS population.

	Neville 1999 (n=15649)	EACS Population 2008 (n=20168)**	EACS Clinic Patients (1236)**
Step 1	4733 (30%)	4353 (22%)	106 (9%)
Step 2	8106 (52%)	9128 (45%)	685 (55%)
Step 3	1856 (12%)	5419 (27%)	368 (30%)
Step 4	823 (5%)	835 (4%)	57 (5%)
Step 5	131 (1%)	433 (2%)	20 (2%)

(** Available data for steps 1 to 5 out of those in the base population and in EACS clinic patients)

Key Messages

- ◆ pMDI recommended by Primary Care Organisations mainly for reason of cost on the basis of NICE recommendations (anecdotal experience and supported by NICE recommendations).^[12,14]
- ◆ This service evaluation has demonstrated that the majority of patients can't use their pMDI correctly, confirming other studies
- ◆ Patient asthma control is adversely affected due to poor inhaler technique^[11]
- ◆ All patients should have their inhaler technique checked prior to initiation and at every review
- ◆ The patient should have their ability to use an inhaler device assessed by a competent health care professional^[2].

Conclusion

Despite training a significant majority of symptomatic asthma patients are unable to use pMDIs correctly. It is essential that patients have their inhaler technique checked prior to initiation and at every review by a competent health care professional to ensure optimum treatment effectiveness.

References

1. Global Strategy for Asthma Management and Prevention, Global Initiative for Asthma (GINA) 2007.
2. Douglas, G. *et al*. Thorax 2008; **63** (Suppl. 4): iv1-iv121
3. Crompton, G.K. Problems patients have using pressurized aerosol inhalers. European Journal of Respiratory Diseases 1982; **63** (Suppl. 119): 101-104.
4. Giraud, V., Roche, N. Misuse of corticosteroid metered-dose inhaler is associated with decrease asthma stability. European Respiratory Journal 2002; **19** (2): 246 - 251.
5. Van Breenendonk, I., Meesters, I. *et al* Assessment of the inhalation technique in outpatients with asthma or chronic obstructive pulmonary disease using a metered-dose inhaler or dry powder device. Journal of Asthma 1998; **35** (3): 273 - 279.
6. www.connectingforhealth.nhs.uk/systemsandservices/ data/miquest
7. www.nmc.org.uk/Article.aspx?ArticleID=3057
8. www.abpi.org.uk/publications/pdfs/pmpca_code2008.pdf
9. www.confidential.oxfordradcliffe.net/caldicott/report
10. www.opsi.gov.uk/Acts/Acts1998/ukpga_19980029_en_1
11. Virchow, J.C., Crompton, G.K., Dal-Negro, R. *et al*. Importance of inhaler devices in the management of airway disease. Respiratory Medicine 2008; **102** (1): 10 - 19.
12. www.nice.org.uk/CG12NICGuideline
13. www.nice.org.uk/TA138
14. Neville, R.G. *et al*. A cost analysis on the pattern of asthma prescribing in the UK. ERJ 1999; **14** (3): 605- 609