Metered-dose Inhaler Technique and Asthma Control in Patients Attending an Urgent Care Clinic in Barbados

A McPherson[1], OP Adams[2]

ABSTRACT

Objective: To estimate the proportion of some Barbadian asthmatics with correct pressurised metered-dose inhaler (MDI) technique.

Methods: All the asthmatics, 12 to 65 years of age, attended an urgent care clinic on selected clinic days over a five-month period, were administered a questionnaire and had their MDI technique evaluated.

Results: Of the 148 respondents (response rate 99%), their median age was 27 years, 28% were males, 99% black of African ancestry; 87% had asthma for six or more years, 83% were using steroid inhalers, 24% were attending for treatment of an asthma attack and only 36% received routine non-urgent asthma care. Sixty-one per cent reported controlled asthma over the previous month, 97% felt that their MDI technique was good and 25% did not identify a healthcare worker as the source of their MDI technique education. Pharmacists almost never provide instructions. In the previous week, 47% had no asthma symptoms or need to use rescue inhalers and 63% had controlled asthma as determined by the asthma control questionnaire. Only 5% (95% confidence interval ± 3.4) had correct MDI technique. All the patients had removed the cap, but only 41% shook the device, 56% actuated the inhaler only once, 11% coordinated actuation and inhalation correctly and 18% held their breath after inhalation.

Conclusions: Few asthmatics had the correct MDI technique. Healthcare workers should use every opportunity to check and teach asthmatics the use of inhaler technique.

Keywords: Asthma, asthma control, Barbados, metered-dose inhaler

Técnica de Inhalador de dosis Medida y Control del Asma en Pacientes que Asisten a Una Clínica de Atención de Urgencia en Barbados

A McPherson[1], OP Adams[2]

RESUMEN

Objetivo: Estimar la proporción de algunos asmáticos barbadenses con la técnica del inhalador de dosis medida (IDM) presurizado correctamente.

Métodos: A todos los asmáticos, de 12 a 65 años de edad, que usaban IDM y asistían a una clínica de atención de urgencia, les fue administrado un cuestionario y se les evaluó su técnica de IDM, en un período de cinco meses en días clínica seleccionados.

From: ¹Winston Scott Polyclinic, St Michael, Barbados and ²Faculty of Medical Sciences, The University of the West Indies, Cave Hill campus, Barbados.

Correspondence: Dr OP Adams, Faculty of Medical Sciences, The University of the West Indies, Cave Hill Campus, St Michael, Barbados. Fax: (246) 438 9170, Email: peter.adams@cavehill.uwi.edu

Resultados: De los 148 encuestados (tasa de respuesta 99%), cuya edad promedio era de 27 años, 28% eran varones, 99% eran negros; 87% había padecido de asma por seis años o más; 83% usaban inhaladores de esteroides; 24% asistían a tratamiento por ataque de asma, y sólo 36% recibía atención al asma de manera rutinaria, no urgente. El 61% reportó haber tenido controlada el asma el mes anterior; el 97% sintió que su técnica IDM era buena, y el 25% no identificó ningún trabajador de la salud como la fuente de su educación en la técnica de IDM. Los farmacéuticos casi nunca proporcionan instrucciones. En la semana anterior, el 47% no tuvo síntomas de asma, ni necesitó usar inhaladores de rescate, y el 63% había controlado el asma según lo determinado por el cuestionario de control del asma. Sólo el 5% (intervalo de confianza del 95% ± 3.4) tenía una técnica correcta de IDM. Todos los pacientes habían quitado la tapa, pero solamente el 41% agitó el dispositivo; 56% accionó el inhalador solamente una vez; el 11% coordinó el accionar y el inhalar correctamente; y el 18% contuvo la respiración después de la inhalación.

Conclusiones: Pocos asmáticos tenían la técnica de IDM correcta. Los trabajadores de la salud deben usar todas las oportunidades para verificar y enseñar a los asmáticos el uso de la técnica del inhalador.

Palabras clave: Asma, control del asma, Barbados, inhalador de dosis medida

INTRODUCTION

The pharmacological management of asthma relies largely on drugs delivered *via* inhalation. In Barbados, most inhaled drugs used for asthma therapy, including those on the Barbados national drug formulary (1), are delivered *via* pressurised metered-dose inhalers (MDI) which offer convenience and portability. However, correct technique is needed for efficient drug delivery to the lower airways, with poor technique leading to poor asthma control and an increased risk of exacerbations (2–5).

For consistent dosing, the MDI first needs to be shaken and then actuation and inhalation have to be coordinated in order to optimise drug delivery to the lower airways. Actuation should occur at the beginning of inspiration and inspiration needs to be slow and deep (6). Actuation even one second before the start of inspiration can reduce drug delivery by up to 90% (7). Spacers with valves can help overcome poor coordination but many patients do not use these devices in Barbados. Many product inserts and guidelines recommend placing the inhaler in the mouth (8, 9), but placing the MDI one to two inches in front of the open mouth may reduce oropharyngeal deposition and hence, increase the amount of drug reaching the lower airways (10, 11). Breath holding at the end of inhalation also increases drug delivery. Lung deposition is decreased 16% with a second as opposed to ten second breath-hold (12).

Many patients are unable to use their MDI correctly (13–16) and may be unaware of the problem (17). A meta-analysis of 24 studies and 3234 participants estimated that 23% (95% CI: 22, 24) participants used the MDI without error (13). Patient education may improve the patients use of the MDI technique (13) but even in the case of chest clinics, one-third of the patients have reported not receiving any education (2). In addition, many healthcare providers are unable to correctly use the MDIs they prescribe (18–20).

This study evaluates the MDI technique of people with asthma attending an urgent care clinic in Barbados for a variety of reasons. It also explores the factors that may influence MDI technique usage, such as healthcare access and assesses asthma control as a possible outcome of MDI technique.

SUBJECT AND METHODS

The study was conducted at the public sector Run Fast Track Unit of the Winston Scott Polyclinic. It is located near the Island's main hospital, the Queen Elizabeth Hospital (QEH). The unit was set-up with the purpose of reducing the workload of the Accident and Emergency Department (A&E) of the QEH. It is open Monday to Friday 10 am to 10 pm and on Saturday from 9 am to 4 pm. Both direct walk-in patients and people referred from the A&E Department with a wide variety of minor complaints attend the unit.

Sampling

All eligible patients attending the Fast Track Unit at the Winston Scott Polyclinic between December 2013 and March 2014 on the days the author AM, a physician at the unit, was working were invited to take part in the study. The eligibility criteria were: the patients must be aged 12 to 65 years, report physician diagnosis of their asthma, used a MDI and should reside in Barbados. The exclusion criteria were: persons that used a spacer with the MDI, people too ill to participate, pregnant women, mentally handicapped persons and prisoners. On the completion of their medical consultation, the eligible persons were invited to take part in the study.

A sample size of 148 participants, showed a 40% prevalence of incorrect MDI technique usage with a 95% confidence interval (CI) of ± 7.8%.

Data collection

Ethical approval was first received from the Institutional Review Board of The University of the West Indies, Cave Hill and the Ministry of Health. The study was then piloted. The data from the pilot were not included in the final study.

After informed consent was obtained, the participants completed a self-administered questionnaire. The information collected included: the subjects' demographic characteristics, self-assessment of MDI technique, asthma healthcare access and the level of asthma control in the previous week by means of questions based on the asthma control questionnaire (21). The six questions were answered on a seven-point Likert scale ranging from zero indicating no symptoms or good control and six indicating uncontrolled asthma. An average score (possible range 0 to 6) of 0.75 or less indicates good control and 1.5 or greater uncontrolled asthma. Spirometry, an optional part of the asthma control questionnaire, was not done.

The participants were then asked to demonstrate MDI technique using the provided placebo inhalers. Assessment was done by means of eight-step checklist which was based on the National Institutes of Health (8), global initiative for asthma [GINA] (9), Canadian asthma consensus report (22) and the American Chest Physicians (23) guidelines. The participants were observed to see if they did the following: removed the caps, shook the inhaler, breathed out fully, held the inhaler upright, placed the inhaler in the mouth or one to two inches away from their opened mouth, actuated the inhaler, began to breathe in slowly and fully at the time of actuation of the inhaler and held their breath for at least 10 seconds. A single observer, AM rated the technique as either, correct or incorrect.

Statistical analysis

The data were entered into predictive analytics software (PASW) statistics 19. The proportions of the participants meeting each of the steps on the eight-step checklist and having asthma symptoms were determined. Chi-square tests were used to test the significance of associations between the categorical variables.

RESULTS

There were 148 participants (response rate 98.7%) of whom 42 (28%) were males and 146 (99%) self-identifying as being Black (of African ancestry). The median age was 27 years (interquartile range 21), 87% had asthma for six years or more and 16% were attending the clinic for treatment of an asthmatic attack (Table 1).

Only 36% had routine follow-up for asthma, 83% were using inhaled steroid inhalers (including 23% using the combination of the long acting βeta blocker and steroid inhalers) and 25% reported never receiving instructions on MDI technique from a healthcare worker. Pharmacists almost never provided instructions.

Table1:   Demographic characteristics of the participants

Characteristic	Number (%)
Gender	
Male	42 (28)
Female	106 (72)
Age (years)	
12 to 20	46 (31)
21 to 40	68 (46)
41 to 60	34 (23)
Highest educational level	
Primary	32 (22)
Secondary (5th or 6th form)	60 (40)
Certificate/skills training	35 (24)
Tertiary	21 (14)
Duration of asthma	
Less than one-year	3 (2.0)
1–5 years	16 (11)
6–10 years	27 (18)
11 years and over	102 (69)
Reason for clinic visit	
Viral illness	63 (42)
Minor injuries	41 (28)
Asthma attack	24 (16)
A check-up	10 (6.8)
Other	10 (6.7)
Cigarette smoking in last month	8 (5)

The majority (97%) thought that they used their MDI with the correct technique (Table 2).

In the previous week, 38% of the participants used βeta agonist rescue inhalers, 28% reported some wheezing and 35% had night-time waking because of their asthma (Table 3).

In the previous week, 70 (47.3%) of the participants did not have any symptoms due to asthma – night time waking, symptoms on awakening in the morning, limitations of activities because of asthma, shortness of breath, wheezing or used a rescue inhaler. Ninety-three (63%) of the participants had controlled asthma based on a mean score of 0.75 or less on the asthma control questionnaire (21) and 40 (27%) had uncontrolled asthma with a score of 1.5 or greater.

Most of the patients had at least one error of MDI technique with 89% not coordinating actuation and inhalation correctly, 60% did not shake the MDI and 45% actuated the MDI more than once (Table 4).

Table 2:   Healthcare source and asthma management

Characteristic	Number (%)
Healthcare source for routine asthma care	
Nil	94 (64)
Public polyclinic	40 (27)
Private physician	5 (3)
Hospital outpatients clinic	4 (3)
Other	5 (3)
Healthcare source for acute asthma attack	
Hospital emergency department	106 (72)
Public polyclinic	28 (19)
Private physician	5 (3.4)
Self-treatment	9 (5.6)
Inhaled medication type	
βeta agonist	145 (98)
Steroid	89 (60)
βeta agonist and steroid combination	34 (23)
Source of inhaler technique education	
Physician	96 (65)
Relative/friend	21 (14)
Nurse	16 (11)
No one	14 (9)
Pharmacist	1 (1)
Has written asthma plan	8 (5)
Owns peak flow meter	8 (5)
Self-assessment of asthma control over last four weeks	
Controlled	91 (61)
Self-assessment of MDI technique	
Correct technique	144 (97)

MDI; Metered-dose inhaler

Table 3:   Asthma control based on symptoms and βeta agonist inhaler use during the preceding week*

Asthma control	Number (%)
Night time waking due to asthma	
Nil	97 (65.5)
A few times	32 (21.6)
Several times	12 (8.1)
Many times/unable to sleep	7 (4.8)
Severity of symptoms on awakening in the morning	
Nil	88 (59.5)
Mild	46 (31)
Moderate	9 (6)
Severe	5 (3.5)
Limitation of daily activities due to asthma	
Nil	114 (77)
Slight	23 (15.5)
Moderate	5 (3.4)
Severe to total	6 (4.1)
Amount of shortness of breath due to asthma	
Nil	89 (60.1)
A little	37 (25)
Moderate	11 (7.4)
A lot	11 (7.5)
Amount of wheezing	
Never	106 (71.6)
A little	30 (20.3)
Moderate	7 (4.7)
A lot	5 (3.4)
Average use of beta agonist inhaler on most days	
None	92 (62.2)
One to two puffs	29 (19.6)
Three to four puffs	15 (10.1)
Five or more puffs	12 (8.1)

*Based on the asthma control questionnaire[21].

Table 4:   Metered-dose inhaler technique assessment

Step	Metered-dose inhaler technique	Number (%) with correct technique
1	Remove cap	148 (100)
2	Shake inhaler	60 (41)
3	Breathe out slowly and fully	25 (17)
4	Hold inhaler upright	146 (99)
5	Position of inhaler	
	In mouth	144 (97)
	Away from mouth	4 (3)
6	Press/actuate inhaler	
	Once	82 (55)
	Twice	59 (40)
	Three times	3 (2)
	Four times	4 (3)
7	Actuate inhaler at the beginning of inspiration	16 (11)
8	Hold breath for at least ten seconds	26 (18)

In all, only ten patients shook the MDI and actuated it once at the commencement of their inspiration (steps 2, 6 and 7 correct) and seven (4.7%, 95% CI ± 3.4) patients got these steps plus holding their breath for ten seconds after inhalation (step 8) correct. There was no significant difference in asthma control by the overall MDI technique or by the performance of individual (steps 2, 6, 7 or 8) correctly ($p > 0.05$). There was also no significant difference ($p > 0.05$) in correct MDI technique usage whether the patient had routine asthma care or not and by educational level (primary, secondary/ certificate/ skills training and tertiary).

DISCUSSION

This study showed that only 5% of the asthmatics attending an urgent care clinic in Barbados used their MDI correctly and almost all the patients being of the opinion that their technique was correct. Thirty-nine per cent of them did not consider their asthma controlled over the previous month and 38% had used a short acting βeta agonist inhaler during the past week. Most of the patients (65%) did not have routine asthma care, a figure similar to that reported in the United Kingdom (24).

The most frequent error of the patients was the incorrect coordination of MDI actuation and inhalation, a step that is expected to cause the most difficulty and requires the most instruction and practice to correct. However, the majority of them also did not shake the MDI or held their breath after inhalation. In addition, two puffs were administered in one go by 40% of the patients rather than with separate inhalations, with a further 5% using more than two puffs. Most often, a dose of the drug used for asthma treatment is two puffs of the MDI and it is likely that 45% of the participants administered the two puff dose with a single inhalation in actual practice. The incorrect performance of these steps (shaking the MDI, single puff and breath holding after inhalation), is likely to result in reduced drug delivery, but should be easy to correct with an educational intervention.

A lack of the awareness of a problem with MDI technique means that the individual is unlikely to take the correct steps in improving their MDI technique unless someone points it out. Teaching MDI technique can result in 63% of patients using the correct technique (13). However, most of the participants did not have routine asthma care and 25% did not learn their MDI technique from a healthcare worker. Pharmacists almost never (1%) are a source of education and this represents a missed opportunity to correct technique, as all patients must get their MDIs from pharmacists.

Limitations

Due to the large percentage of people with poor MDI technique, the power to detect a difference in asthma control by the technique was low. Asthmatics attending an urgent care clinic may not be representative of the general asthmatic population in Barbados.

CONCLUSION

Few patients had correct MDI technique. Routine asthma care should be encouraged, and healthcare workers should use every opportunity to check and teach patients the correct use of MDI technique.

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