

ADEQUATE USE OF ASTHMA INHALATION MEDICATION IN CHILDREN: MORE INVOLVEMENT OF THE PARENTS SEEMS USEFUL

Johannes HJM Uijen, Yannick JW van Uijthoven, Johannes C van der Wouden, Patrick JE Bindels

Department of General Practice, Room Ff305, Erasmus MC – University Medical Center Rotterdam, PO Box 2040, 3000 CA Rotterdam, The Netherlands

ABSTRACT

Background: Asthma and other chronic airway diseases can be effectively treated by inhaler therapy. This study evaluates the knowledge among Dutch children and their parents regarding asthma inhaler therapy and appropriateness of its use.

Findings: Five general practices selected all children aged 0 to 12 years on asthma inhalation medication. Children demonstrated inhaler use and were interviewed with their parents.

Conclusion: Dutch children make essential mistakes related to inhaler use that are easy to avoid. We recommend a better explanation and demonstration of the technique, and recommend involvement of the parents during instruction.

Key words: asthma, inhalation medication, chronic airway diseases

INTRODUCTION

Asthma and other chronic airway diseases can be effectively treated by inhaler therapy (1). Inhaler devices come in a variety of types, such as metered dose inhalers (MDI) or dry powder inhalers (DPI). Irrespective of the type of inhaler device used, the outcome of inhaler therapy largely depends on appropriate use of the inhaler.

Appropriate use primarily involves the correct inhalation technique. A poor inhalation technique reduces drug deposition in the lungs (2); moreover, the more mistakes made in the inhalation technique the lower the beneficial effect on lung function (3). From adults it is known that 89% of the patients make at least one mistake in the inhalation technique (4). Also children face difficulties in using an inhaler.

Appropriate inhaler use also involves actual use compared with the advised regimen of the prescriber. Several studies have shown that, even with adequate inhaler use (between 50 and 80% of prescribed doses), compliance with inhalation corticosteroids (ICS) is far from perfect (8-12). Overuse of bronchodilators has also been reported and some parents confuse the corticosteroid

inhaler (for maintenance therapy) with the bronchodilator inhaler (to be used in case of symptoms) (13,14).

METHODS

Subjects

We included all children aged from 0 to 12 years who had been prescribed inhalation medication in the last three months. A convenience sample of five Dutch general practices in both rural and urban areas was invited to participate.

Data collection

The general practitioner (GP) sent parents of the children a letter with an informed consent form, a request to participate, and an answer form that had to be returned to the investigators. Subjects that responded positively were visited at home during the period April to July 2007 by a well-trained investigator who observed the inhalation technique and held a face-to-face interview.

Questions on the inhalation technique were posed to the children themselves if they were aged five

years and older; if they were younger the parents answered these questions. Additional general questions were always answered by the parents.

Assessing appropriate use

The investigator assessed the child's inhalation technique using an inhaler specific checklist adapted from the checklists of the Dutch Asthma Foundation (16,17). Children were asked to demonstrate their inhalation technique and any mistakes were written down. Essential mistakes were identified (17). These involved preparing or loading the device prior to inhalation; slow continuous inhalation (MDI) or deep forceful inhalation (DPI); waiting too long before inhaling a spacer after activating the MDI; and incorrect spacer mask use.

Finally the parents were asked how they assessed the number of remaining doses and how they cleaned the device.

RESULTS

Response and inhaler use

All five practices agreed to participate and a total of 162 children were selected from the electronic medical files. A reply was received from 56 subjects (34%), of which 10 (16%) refused to participate. The most frequently mentioned reason for refusal (among responders) was that the inhalation medication was no longer used. The most frequent reason for refusal (among responders) was that the inhalation medication was no longer used. Two subjects refused because of a stressful situation at home. The 46 subjects (28%) enrolled had a mean age of 5.5 (SD 3.4) years. Thirty (65%) were aged five years or older. Twenty-six (57%) of the subjects were boys. Twelve (26%) of the children lived in an urban region, while 34 (74%) lived in a rural area. Most children (n = 41; 89%) used an MDI in combination with a spacer device, four children (9%) used a DPI and only one child (2%) used an MDI without a spacer. Thirty-three children (72%) used a bronchodilator in combination with an ICS, the remaining children used either a bronchodilator (n = 12; 26%) or an ICS (n = 1; 2%).

Inhalation technique

Not shaking the inhaler before use was the most frequently made mistake (n = 9; 20%) during the demonstration; and "When I need two doses, I can activate MDI twice before starting to inhale through spacer" was the most frequently noted incorrect answer (n = 19; 43%). Each child made on average 2.6 mistakes (range: 0-7) in demonstrating, and on average 2 mistakes (range: 0-5) were noted on the questionnaire.

Actual use of inhalers compared with prescribed use

Pharmacy prescription labels were available from 32 children. Twenty of the 32 children (63%) used the inhaler as indicated on the prescription label. All children having one inhaler used their inhaler as indicated on the prescription label. Of the children having two inhalers, only 39% used both their inhalers as indicated on the label. The following mistakes were made: three children used their bronchodilator 'as needed' instead of daily. Five children used their bronchodilator daily instead of 'as needed'. Four children were using their ICS 'as needed' and one child did not use the prescribed bronchodilator.

Education

Of all parents, 42 (91%) had received some instruction about the inhalation technique; this instruction was clear for 41 of them. Of these 42 parents, 19 (45%) had received instruction at the pharmacy, 11 (26%) at the general practice, 7 (17%) at the hospital, 4 (10%) had more than one source of instruction, and 1 (2%) had received instruction from friends or family. There was no relationship between the different sources of education and mistakes related to inhalation technique or therapy adherence.

Therapy inconsistency

To determine therapy inconsistency we compared the reported use with the pharmacy prescription label, in our opinion the most appropriate source for comparison. The use of more than one inhaler was most frequently the reason for inappropriate use. Parents decide when and how the inhaler is to be used for most of the children, which confirms their important role in compliance with inhaler therapy. Noteworthy is that four children only used their ICS in case of symptoms, although ICS are a long-term maintenance therapy and should be administered daily.

Inhalation technique

We found that many subjects did not shake their inhaler (c.f. Kamps et al)(6). However, despite their mistake, most subjects knew that the inhaler had to be shaken before use. On the other hand, nineteen subjects did not know that it is recommended to activate the MDI once, inhale the first dose of drug, and then activate the MDI again for a second dose (16).

Inhaler management

Most parents reported an incorrect method of assessing an inhaler for remaining doses. Most of

them spray in the air to see whether the inhaler still contains gas. Fifteen subjects reported that they clean and dry their spacer with a towel. This is incorrect because the generated static load will prevent the drug from leaving the spacer for the first few inhalations (16). Four subjects reported that they never cleaned their spacer.

Strengths and limitations

This present study has several potential limitations. Although our strategy of using self-reports may not be ideal, no feasible alternative is available (8,10,12). During the technique demonstration, some of the younger children became shy, which probably influenced their inhalation technique. The limited number of general practices and pharmacies may have affected the results. The proportion of responders, although low, is not uncommon in this setting (18). As responders were probably more compliant, given their interest in the study, the overall compliance and inhaler technique might be even worse than our results suggest.

Strength of the present study is that the children were visited at home allowing them to demonstrate their inhalation technique in a familiar environment. We also explored knowledge on the inhalation technique and use, and combined these findings with the prescription.

CONCLUSION

Children and their parents still make a variety of mistakes when using an inhaler. Concerning the inhalation technique, some easy to avoid mistakes were made, e.g. shaking and activating twice an inhaler before use. Therapy adherence was not optimal, especially when more than one inhaler was prescribed. In addition, mistakes were made related to cleaning the spacer and assessing the inhaler for remaining doses.

Practice implications

Inadequate knowledge of when and how to use prescribed medication is one of the major barriers in achieving asthma control (19). It is important that the GP give appropriate and written instruction to the parents, who play a prominent and important role in compliance with therapy of their children.

First of all, the inhalation technique should be clearly explained and well demonstrated. Preferably, this should be checked again during follow-up appointments to correct mistakes. Therapy regimen should be discussed, particularly when more than one inhaler is prescribed. An explanation of the difference between maintenance therapy and rescue medication is essential.

Preluat de *BMC Family Practice* 13 iulie 2009, cu permisiunea editorului

REFERENCES

- Masoli F, et al.: Global Burden of Asthma, 2004. (<http://www.ginasthma.org>) *webcite*
- O'Connell EJ: Optimizing inhaled corticosteroid therapy in children with chronic asthma. *Pediatr Pulmonol* 2005, 39:74-83.
- Pedersen S, Frost L, Arnfred T: Errors in inhalation technique and efficiency in inhaler use in asthmatic children. *Allergy* 1986, 41:118-24.
- van Beerendonk I, Mesters I, Mudde AN, Tan TD: Assessment of the inhalation technique in outpatients with asthma or chronic obstructive pulmonary disease using a metered-dose inhaler or dry powder device. *J Asthma* 1998, 35:273-9.
- Chen SH, Yin TJ, Huang JL: An exploration of the skills needed for inhalation therapy in schoolchildren with asthma in Taiwan. *Ann Allergy Asthma Immunol* 2002, 89:311-5.
- Kamps AW, van Ewijk B, Roorda RJ, Brand PL: Poor inhalation technique, even after inhalation instructions, in children with asthma. *Pediatr Pulmonol* 2000, 29:39-42.
- Vella C, Grech V: Assessment of use of spacer devices for inhaled drug delivery to asthmatic children. *Pediatr Allergy Immunol* 2005, 16:258-61.
- Milgrom H, Bender B, Ackerson L, Bowry P, Smith B, Rand C: Noncompliance and treatment failure in children with asthma. *J Allergy Clin Immunol* 1996, 98:1051-7.
- McQuaid EL, Kopel SJ, Klein RB, Fritz GK: Medication adherence in pediatric asthma: reasoning, responsibility, and behavior. *J Pediatr Psychol* 2003, 28:323-33.
- Bender B, Wamboldt FS, O'Connor SL, Rand C, Szeffler S, Milgrom H, et al.: Measurement of children's asthma medication adherence by self report, mother report, canister weight, and Doser CT. *Ann Allergy Asthma Immunol* 2000, 85:416-21.
- Gibson NA, Ferguson AE, Aitchison TC, Paton JY: Compliance with inhaled asthma medication in preschool children. *Thorax* 1995, 50:1274-9.
- Jonasson G, Carlisen KH, Sodal A, Jonasson C, Mowinckel P: Patient compliance in a clinical trial with inhaled budesonide in children with mild asthma. *Eur Respir J* 1999, 14:150-4.
- Gustafsson PM, Watson L, Davis KJ, Rabe KF: Poor asthma control in children: evidence from epidemiological surveys and implications for clinical practice. *Int J Clin Pract* 2006, 60:321-34
- Mudd K, Bollinger ME, Hsu VD, Donithan M, Butz A: Pharmacy fill patterns in young urban children with persistent asthma. *J Asthma* 2006, 43:597-600.
- WHO Collaborating Centre for Drug Statistics Methodology (<http://www.whocc.no/atcddd>)
- Netherlands Asthma Foundation (<http://www.astmafonds.nl>)
- Palen J, Klein JJ, Van Herwaarden CLA, Zielhuis GA, Seydel ER: Multiple inhalers confuse asthma patients. *Eur Respir J* 1999, 14:1034-7
- Van der Wouden JC, Blankenstein AH, Huibers MJH, Van der Windt DAWM, Stalman WAB, Verhagen AP: Survey among 78 studies showed that Lasagna's law holds in Dutch primary care research. *J Clin Epidemiol* 2007, 60:819-24.
- Dekhuijzen PN, Magnan A, Kneussl M, ADMIT Working Group: The ADMIT series – issues in inhalation therapy. *Prim Care Respir J* 2007, 16:341-8.
- Haynes RB, Ackloo E, Sahota N, Mc Donald HP, Yao X: Interventions for enhancing medication adherence. *Cochrane Database Syst Rev* 2008, (2):CD000011.