

Inhalation technique in asthma in children: could an intensive summer educational camp improve it?

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To the Editor,

Asthma camp is a summer camp involving children with asthma. Its aim is to provide a positive experience for these children through activities related to asthma education, socialization, activities in nature and sport. It is demonstrated that children attending asthma camps improve asthma self-management skills and their quality of life (1). About asthma self-management skills, an improvement of peak flow meter values and a reduction of school absenteeism, emergency room visits, use of beta-adrenergists, number of asthma attacks were demonstrated after the experience of an asthma camp (2). Regarding the increase of quality of life, both children and adolescents seem to get a positive result from attending a school camp. Regarding children, the best results are represented by the acquisition of greater independence from their parents. Regarding adolescents, positive results consist in the awareness that asthma is a chronic disease that needs medical care and treatment, an improvement of their self-concept and a social integration (3). In this context, the experience of an asthma camp can be seen as a peer-led-experience in this age. Preliminary evidence underline that this experience can represent the right instrument to improve clinical and psychological outcomes related to asthma in this difficult age (4). The right disease management represents an important aspect in the asthma control. In this context, the correct use of inhalation technique is fundamental, especially in pediatric age. At the same time, most patients (up to 80%) cannot use their inhaler correctly (5). Regarding children up to 6 years old, the preferred

device is a pressurized metered dose inhaler (pMDI) and spacer with a mouthpiece (5). The correct use of the inhalatory technique through the use of pMDI and spacer is mandatory for asthma control and is illustrated on the GINA (www.ginasthma.org) and ADMIT website (www.inhalers4u.org) (5). The importance of a correct inhalation technique for a good asthma control is related to the risk of a decreased efficacy through the reduced deposition of medication in the lungs if this technique is used incorrectly (6). Specifically, inhaler errors are related to a lot of reasons: failure to remove the cap, ensure a tight seal when mouthpiece is inserted into spacer, hold spacer with inhaler upright, actuate just one dose into the spacer, hold breath, inhale and exhale correctly (6). A lot of evidence, including GINA guidelines, underline the importance of repeatedly instructing patients with asthma on the use of their pMDI and spacer (6). In addition, it is demonstrated that the experience of asthma camp is related to an overall improvement in pMDI technique (2). Based on this observation, we made up an intensive asthma summer camp training the children every day using a standard protocol that included step-by-step instructions for the correct use of pMDI and spacer. The aim of this first preliminary prospective study regarding a 3-days intensive asthma summer camp was to evaluate the impact that a structured short-term educational asthma camp could have on performance in the use of pMDI and spacer by the children involved. The ASMANATURA camp has been conducted for children with asthma in the town of Pieve di Coriano, Mantova, Italy. Ten children with asthma attended a 3-days educational camp program in June 2021.

All children had been diagnosed with asthma and took pMDI for at least 1 year. Their asthma had been classified in accordance with the Global Initiative for Asthma guidelines (5). The children were recruited from the out-patient clinics of the Hospitals of Pieve di Coriano and Mantova, Italy. A pediatric allergologist, responsible for organizing and coordinating the asthma summer camp, followed the children in this experience and made assessments of the inhalation technique for each child at the beginning and the end of the 3-days asthma summer camp. At the camp, the children received 60-min interactive educational sessions every day with the aim to improve their knowledge of asthma, asthma triggers, asthma medications, the knowledge of disease-related psychosocial behavior, as well as the appropriate use of spacer devices in asthma self-management. Specifically, the inhalatory technique through the use of a pMDI and the spacer was supervised and improved every day for each child. On the basis of the indication reported on ADMIT website, suggested by GINA guidelines, 11 correct steps were evaluated to meet the criteria of appropriate use of pMDI and the spacer (Supplementary material, tab S1) (5). 7 patients (6 males, 1 female) were evaluated and received the *modified MDI use score (mMus)* at the beginning and the end of the 3-days asthma summer camp. 3 patients were not included in the study because they didn't participate at the day 3. The changes in the results obtained before and after the educational program were analyzed using Excel 2020[®]. Statistical analysis was not performed for the low sample size. This study was approved by the Ethics in Research Committees Val Padana (code 47-2021). Written informed consent was obtained from the parents or legal guardians of all participants.

The median age during the asthma summer camp was 129 months (range 92-153 months). In according to the Global Initiative for Asthma, two patients were classified as step 1, two patients as step 2, two patients as step 3, one patient as step 4. The median value of *mMus* at the beginning of the asthma summer camp was 8 (range 6-11). The median value of *mMus* at the end of the asthma summer camp was 10 (range 8-11). The step number 6 of the inhalation technique, regarding the exhalation before the administration of therapy, had the best increase (+250%) in the comparison between beginning and end-asthma camp *mMus* values. The overall improvement in inhalation technique was

Table 1. mMus beginning and after asthma camp for each child.

Patient	mMus beginning asthma camp	mMus end asthma camp
1	11	11
2	8	8
3	6	10
4	6	11
5	9	10
6	7	10
7	11	11

+25%. Examining children individually, only one child didn't improve his *mMus* values (tab. 1). This study has some limitations. First, the low simple size, due to the impossibility of gathering more children because of the restrictions imposed by the covid 19 pandemic. Second, data were collected in a single asthma camp. Third, due to the low number of the sample and the fact that asthma education is operator sensitive, it is possible that these results are not reproducible in all cases. Finally, it was not possible to check after some times the consolidation of the improvement of the inhalation technique.

In conclusion, this is the first preliminary prospective study demonstrating that a 3-days intensive asthma summer camp is related to an overall improvement in pMDI technique in children affected by asthma. On the basis of this result and other evidence in the literature (1-4), it represents another proof that asthma summer camp is a fundamental instrument to improve asthma education and management in children and adolescent affected by asthma.

Conflicts of interest: Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.

Ethics Committees: Study approved by the Ethics in Research Committees Val Padana (code 47-2021).

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Authorship: LP and AN designed the work, acquired, analyzed the data, drafted the initial manuscript and reviewed the manuscript. PA, LDC, GP, AP analyzed the data and reviewed the manuscript.

AP conceptualized, designed the work, acquired, analyzed the data, drafted the initial manuscript and reviewed the manuscript. All authors approved the final manuscript as submitted and agreed to be accountable for all aspects of the work.

Abbreviations: MDI: pressurized metered dose inhaler; mMUS: modified MDI use score

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Supplementary material

table S1. Steps evaluated to meet the criteria of appropriate use of MDIs by the examiner.

Please note: it is mandatory to use a spacer

The examiner must tick all steps performed correctly.

Name patient:.....

Date:.....

Name of the instructor:

Before every use

- 1. Remove the cap from the inhaler.
- 2. The mouth must be empty.
- 3. Shake the inhaler well.
- 4. The inhaler is now ready for use.

Inhalation

- 5. Sit or stand up straight with your head slightly backwards.
- 6. Exhale slowly and fully, not into the inhaler.
- 7. Bring the inhaler upright with the opening on the lower side, towards your mouth.
- 8. Put the mouthpiece between teeth and close lips to form a good seal.
- 9. Press down on the inhaler canister once at the start of a deep inhalation (4 seconds).
- 10. Hold breath for 10 seconds, or as long as comfortable. Meanwhile remove the inhaler from the mouth.
- 11. Exhale slowly.