


Role of asthma camp in improving the overall health of children with asthma

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ABSTRACT

This study sought to evaluate the benefit of asthma camp for patients who attended Baylor Scott & White McLane Children's Medical Center's Camp Wheeze Away in July 2016. Data were collected on children aged 8 to 15 years who were diagnosed with asthma and attended asthma camp. Information on body mass index, hospital admissions, and emergency department visits was collected 1 year before and 1 year after camp. Asthma control tests, exhaled nitric oxide tests, and pulmonary function tests were administered at the beginning and end of camp. A total of 34 children with asthma (mean age 11 [\pm 2] years) were included in this study. Postcamp asthma-related hospitalizations and emergency department visits decreased. Mean asthma control scores improved from 20.4 (\pm 3.2) before camp to 23.4 (\pm 2.8) after camp ($P < 0.0001$). Forced expiratory volume during the first breath and forced expiratory flow at 25% to 75% of the pulmonary volume improved during the weeklong camp ($P = 0.04$ and 0.0007 , respectively). Forced expiratory volume during the first breath further improved 6 to 12 months after camp compared to values before camp ($P = 0.047$). Exhaled nitric oxide levels improved from the first to last day of camp by decreasing an average of 39% ($P = 0.0009$). This study showed the positive effect that a short-term educational intervention in a camp setting had on asthma control scores and asthma knowledge.

KEYWORDS Asthma; child; education; self-management

Asthma is one of the most prevalent chronic pediatric illnesses in the United States, affecting 9% of children, 24% of whom are limited in their physical activity due to asthma.¹ Asthma is the third leading cause of pediatric hospitalizations among children <15 years and the leading cause of school absenteeism in the United States.² Asthma also places a significant burden on the health care system. In 2013 alone, Medicaid costs in Texas for children with asthma totaled nearly \$91.9 million.³ Despite its prevalence, asthma is a critically misunderstood disease.

Providing education about the management of asthma symptoms is a vital part of patient care. Self-management skills are key to controlling symptoms and avoiding acute exacerbations.⁴ Pediatric summer camps are emerging to increase social support and improve children's attitudes about this chronic illness.⁵ Asthma camps have been shown to effectively reinforce asthma education and teach self-management skills.^{6–8} Asthma camps, spanning from one to several days, include a combination of education, physical

activities, social activities, and clinical monitoring. Several studies have demonstrated that children who attend asthma camps demonstrate improved patient adherence and technical skills while using metered dose inhalers and spacers.^{6,9,10} Other studies reported a decrease in the number of outpatient office visits, emergency department (ED) visits, and hospitalizations for asthma exacerbations among patients who attended asthma camp.^{9,10} A significant decrease in emergency outpatient visits and missed school days was noted 6 to 12 months after attending asthma camp.^{5,11} Furthermore, general asthma knowledge, physical activity, and quality of life increased among camp participants.^{6,12–14} Adolescents demonstrated increased responsibility in managing asthma after attending asthma camp.¹⁴ Airway inflammation, as measured by exhaled nitric oxide, improved during 1 week of asthma camp, likely because of better adherence to therapy and lack of exposure to inflammatory stimuli in the home.¹³ This study sought to further report on the benefit of attending asthma camp.

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Table 1. Correct responses on the asthma knowledge questionnaire among 34 attendees before and after attending asthma camp

Question	Before	After	P value
1. Having flu can cause an asthma attack	29 (85%)	31 (91%)	NS
2. Smoking is OK for people with asthma	32 (94%)	32 (94%)	NS
3. If you do not have asthma now, you will never get it	28 (82%)	33 (97%)	0.023
4. People with asthma can die if not treated well	31 (91%)	32 (94%)	NS
5. Medicines that keep asthma from happening should be taken every day	33 (97%)	33 (97%)	NS
6. Rest is needed to stop an asthma attack	23 (68%)	31 (91%)	0.009
7. An asthma attack can happen suddenly without warning	31 (91%)	33 (97%)	NS
8. When asthma is OK, all medicines can be stopped	30 (88%)	30 (88%)	NS
9. With the right treatment, a child with asthma can live a normal life	31 (91%)	33 (97%)	NS
10. Children with asthma can play sports	29 (85%)	32 (94%)	NS
11. List three signs of asthma	23 (68%)	32 (94%)	0.002

NS indicates not significant.

METHODS

Baylor Scott & White McLane Children's Medical Center has offered an asthma camp, Camp Wheeze Away, for more than a decade. This 5-day, 4-night camp is for children aged 8 to 15 years who have been diagnosed with asthma and is funded by the Children's Miracle Network. The camp includes daily education sessions on the physiology of asthma, triggers, medications, and what to do during an exacerbation. The proper use of spacer devices and peak flow meters is taught. In addition to daily asthma education, the camp allows children to have as normal a camping experience as possible by enjoying activities such as swimming, fishing, rock climbing, and zip lining. Children are invited to attend camp based on their age and asthma severity, taking into account the number of ED visits for asthma-related events. The camp is supervised by registered nurses, registered respiratory therapists, a child life specialist, and a pulmonologist.

To evaluate the benefit of attending asthma camp, this study collected data on all patients who attended Camp Wheeze Away in July 2016. Information on demographic characteristics, body mass index (BMI), and number of hospital admissions and ED visits 1 year before and 1 year after camp was obtained from an electronic medical record database. On the first and last days of camp, an asthma control test (ACT), exhaled nitric oxide (eNO) test, and pulmonary function test were administered. The pulmonary function test measured forced expiratory volume during the first breath (FEV1) as well as forced expiratory flow at 25% to 75% of the pulmonary volume (FEF25–75). Patient attitudes and knowledge were assessed via a questionnaire completed on the first and last days of camp. The questionnaire was split into two sections: asthma knowledge and asthma perceptions/attitudes. The asthma knowledge portion

consisted of 15 questions, and each correct answer received one point. The asthma perceptions/attitudes portion consisted of 12 questions, and the responses were measured on a 5-point Likert scale. Patients were seen by a pediatric pulmonary specialist for pulmonary testing 6 to 12 months after camp.

This study was approved by the Baylor Scott & White Health institutional review board. Written informed consent was obtained from the parents or legal guardians of all participants.

Means and standard deviations (or medians and ranges, if appropriate) were reported for continuous and semicontinuous variables. Frequencies and percentages were reported for categorical variables. The Wilcoxon signed rank test was used to test for differences in BMI, eNO, FEV1, and FEF25–75 pre and post measurements. Levene's test was used to test for differences in ACT scores, and Wilcoxon rank sum tests were used to test for differences in attitude scores, hospital admissions, and ED visits. SAS (Version 9.4; SAS Institute, Cary, NC) was used for all statistical analyses. Significance is indicated as $P < 0.05$.

RESULTS

A total of 34 children with asthma, including 19 males (mean age 11 [±2] years), were included in this study. Of those, 17 (52%) were white and 11 (33%) were black. Median BMI was 19.2 kg/m² (range: 13.9–33.2) with no significant changes in BMI noted from 1 year before to 1 year after camp. The median number of years a child had been diagnosed with asthma was 10 years (range: 3–15). Most campers (59%) had Medicaid, and 41% had private insurance. All campers had asthma action plans in place before starting camp.

Table 2. Asthma attitudes and perceptions of 34 attendees before and after attending asthma camp

Statement	Response of <i>strongly agree</i>	
	Before	After
1. When I cough or feel short of breath, I know what to do to feel better	23 (68%)	28 (82%)
2. Coughing or feeling short of breath makes me nervous	7 (21%)	5 (15%)
3. All of my friends know I have asthma	12 (35%)	15 (44%)
4. I always take an asthma pump with me when I leave the house	14 (41%)	14 (41%)
5. I get embarrassed when I feel short of breath	2 (6%)	1 (3%)
6. I get embarrassed when I take asthma medicine in front of my friends	5 (15%)	1 (3%)
7. Many of my friends have asthma	2 (6%)	7 (21%)
8. There are things I cannot do because I have asthma	7 (21%)	6 (18%)
9. I can remember a time when my asthma was so bad that I was afraid I was going to die	11 (32%)	15 (44%)
10. In the future my life will be better than it is now	19 (56%)	25 (74%)
11. I will do great things in the future	27 (79%)	28 (82%)
12. I will live a long, healthy life	26 (76%)	29 (85%)

In the year before camp, 11 (32.4%) patients were admitted to the hospital and 15 (44.1%) visited the ED due to asthma complications. In the year after camp, asthma-related hospitalizations and ED visits decreased by 82% to two visits ($P=0.005$) and by 60% to six visits ($P=0.02$), respectively. Mean ACT scores improved from 18.8 (± 3.0) before camp to 23.4 (± 2.8) after camp ($P<0.0001$). Furthermore, improvement in ACT scores was maintained 6 to 12 months following camp (21.3 ± 3.5 , $P=0.01$). FEV1 and FEV25–75 improved during the week of camp ($P=0.04$; $P=0.0007$). There was also noted improvement in FEV1 6 to 12 months after camp compared to FEV1 before camp ($P=0.047$). Changes in FEF25–75 at 6 to 12 months after camp were not significant. eNO levels improved from the first day to the last day of camp by decreasing an average of 39% ($P=0.0009$). There was no significant difference in eNO levels 6 to 12 months after camp compared to before camp. There was a reduction in the mean number of steroid prescriptions in the year after camp (0.9 ± 1.0) compared to the year prior to camp (1.9 ± 1.7 ; $P=0.001$). No campers required steroids, ED visits, or hospitalizations during camp.

The impact of the daily education sessions on asthma knowledge is depicted in *Table 1*. The mean number of correct answers was 10 on the pretest and 12 on the posttest ($P<0.0001$). As shown in *Table 2*, overall, patients' attitudes and perceptions of asthma improved during camp.

DISCUSSION

A recent consensus published by Papadopoulos et al states that asthma education for children should include information regarding the chronic nature of the illness, the need for long-term therapy, and the importance of adhering to the prescribed regimens.¹⁵ Most important, education

should involve hands-on demonstrations to ensure that patients understand how to use their equipment. Tailoring educational approaches by age group is also integral to ensuring participation and understanding.¹⁵ Camp Wheeze Away was designed to include all components of this educational approach, and the findings from this study depict the camp's success in improving patients' knowledge and attitudes regarding asthma management strategies.

This study showed the positive effect that a short-term educational intervention conducted in an alternate setting (i.e., a weeklong summer camp for children with asthma) had on ACT scores and asthma knowledge. Learning proper techniques for administering medications led to a decrease in asthma-related hospital admissions and ED visits among patients who attended camp. Moreover, FEV1 and FEF25–75 improved during camp. Improvement in FEV1 was noted 6 to 12 months after camp, indicating that the management strategies taught were effective over long-term follow-up.

Although research on the link between childhood obesity and asthma is significant,^{16,17} few studies have addressed obesity, physical activity, or BMI in an asthma camp setting. In the present study, changes in BMI were not evaluated during the week of camp, because it would be difficult to affect physiological change within the short time frame. Future camps could measure physical activity levels or behavioral changes before and after camp to determine whether camp attendance influences physical activity behavior among participants. For example, a case-control study by Lin et al evaluated the effects of a 1.5-day swimming camp on self-efficacy, exercise behavior, and parental support in children with asthma.¹⁸ All children were elementary school aged

(grades 1–6) and had no other physical or neurological deficits. All outcomes of interest were measured using questionnaires. The camp program included 20 minutes of physical activity education, two 2-hour swimming sessions, and a 2-hour conference with parents. Researchers found that self-efficacy and parental support did not differ between the two groups at 1 and 2 months post camp. However, exercise behavior 2 months after camp was found to be significantly different between groups, with the case group having higher questionnaire scores than the control group.¹⁸

Summer camps that address other chronic pediatric illnesses can be used to determine whether this setting is effective for modifying management behavior. A review by Henderson et al found that, although camps provide increasingly diverse experiences, they typically benefit children by improving confidence, self-esteem, social skills, and independence.¹⁹ Moreover, researchers have found that children with chronic illnesses receive great benefit from attending specialized camps.¹⁹ In addition to asthma, summer camps exist for a variety of diseases, including cystic fibrosis, arthritis, spina bifida, cancer, diabetes, and epilepsy.^{20,21}

There were some limitations of this study, in that asthma knowledge and asthma attitudes and perceptions were not assessed at the 6- to 12-month postcamp follow-up due to change in personnel. In addition, the campers served as their own controls and as a result the improvement noted could be due to regression to the mean, which is a known concern of pre/postintervention studies.

In conclusion, we found that the asthma camp experience reinforced proper management strategies that resulted in an increase in lung function, attitudes and knowledge, ACT scores, and spirometry, as well as a decrease in ED visits and hospitalizations, after the camp. Our results illustrate that summer camps are effective in teaching children to live successfully with asthma.

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