ABSTRACT

Background: Asthma diminishes the health-related quality of life for many school-aged children. This study sought to explore the effect of a School-Based Asthma Education Program (SBAEP) on quality of life.

Methods: Children with asthma who attended grades 1 - 5 at two selected schools were requested to participate in this pilot study. Participants at one school were provided with a SBAEP, those at another school (control group) were provided with written educational material about asthma. The children completed the Paediatric Asthma Quality of Life Questionnaire (PAQLQ) before and one month after the educational interventions.

Results: There were clinically important improvements in the SBAEP group in quality of life, specifically in the symptom sub-domain.

Conclusions: The "Air Force" SBAEP appears to result in a favourable trend in quality of life for children. A larger scale trial is required following revisions to the program.

ABRÉGÉ

Contexte : L'asthme réduit la qualité de vie de nombreux enfants d'âge scolaire. Notre étude portait sur l'effet d'un « programme de sensibilisation à l'asthme en milieu scolaire » (PSAMS) sur la qualité de vie.

Méthode : Nous avons demandé à des enfants asthmatiques de la 1^e à la 5^e année fréquentant deux écoles de participer à une étude pilote. Les participants d'une des écoles avaient été dotés d'un PSAMS; ceux de l'autre (le groupe témoin) avaient reçu du matériel pédagogique écrit sur l'asthme. Avant ces interventions pédagogiques et un mois après, les enfants ont rempli un questionnaire sur leur qualité de vie.

Résultats : Nous avons constaté des améliorations cliniques importantes dans la qualité de vie du groupe PSAMS, particulièrement pour l'élément « symptômes ».

Conclusions : Le programme (« Air Force ») semble avoir un effet positif sur la qualité de vie des enfants. Après les révisions qui y seront apportées, il faudrait mener un essai à plus grande échelle.

Assessing the Efficacy of a School-Based Asthma Education Program for Children: A Pilot Study

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Asthma has been of increasing concern in recent years because of increasing prevalence, and associated increases in burden of illness and demand on health services.^{1,2} The total costs of asthma in Canada during 1990 have been estimated at 504 million dollars. This represents 0.4% of the economic burden of illness in Canada and 7.1% of the burden of respiratory illness.³

While asthma affects people of all ages, the burden of illness falls most heavily on young, multiracial, lower socio-economic groups, who are at higher risk for both morbidity and mortality.⁴ The greatest rise in the prevalence of asthma appears to be in children with a reported prevalence of 5-6% in developed countries.⁵ It is the most prevalent chronic disorder of childhood.⁶

There have been a variety of studies assessing the impact of various prevention and treatment strategies for asthma. Studies have measured effect on: patient knowledge, clinical status, patient satisfaction, health-related quality of life, economic impact, and health services utilization (e.g., refs. 7 and 8). However, few have measured effects on quality of life. Furthermore, most studies have dealt with adult populations.

In the past decade, there has been heightened emphasis on strategies specifically targeting children with asthma.⁹

Given the individual and societal impact of asthma on both the child and family, different approaches are required to enhance comprehensive care and reduce the burden of illness in this age group.⁶ Educational interventions are considered an important part of all care programs.

A review of the literature revealed a number of hospital- and community-based asthma education programs for children that have been evaluated. These studies show subtle improvements in asthma management and some associated reductions in health services utilization (e.g., refs. 1, 10, 11). A meta-analysis by Bernard-Bonin et al. showed that interactive self-management education programs had only small impact on asthma attacks, school absences, emergency department visits, hospitalizations, and hospital days associated with asthma, with the pooled effect sizes for all variables below 0.2.¹²

Research studies have also assessed school-based asthma education programs (SBAEP). Evans et al. showed that a health education program for 8 to 11 year olds improved their asthma management and self-efficacy skill scores, while reducing the number and length of asthma episodes.¹³ Christianson et al. demonstrated that fourth grade students' mean scores for asthma knowledge improved from 9.9 to 13.7 (on a scale from 0 to 17), peak flow meter technique improved from 3.9 to 6.4 (on a scale of 1 to 8), and inhaler technique improved from 2.3 to 4.3 (on a scale of 1 to 7), following a SBAEP.¹⁴ There was also a reduction in the mean symptom scores compared to the control group after six months.¹⁴

In summary, the literature suggests there are some benefits to children receiving asthma education, but the effects are small

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and inconsistent. Because of the large burden of illness associated with childhood asthma and the lack of evidence regarding its effect on health-related quality of life, further research is required. The recent development of a valid and reliable measure of health-related quality of life that is specific to asthma provided an opportunity to uncover the true effect, where previous studies had been inconsistent.

The program evaluated here was the Air Force asthma education program. It was designed to educate children and their parents about asthma and its management. It has been provided by the local Lung Association in a variety of hospital and school settings for approximately 10 years, but had not been evaluated for effectiveness. This study was undertaken in two elementary schools in the East York area of Toronto. The objective was to measure the program's effect on the health-related quality of life of children. The target population was 6 to 12 year old children who had been identified by their parents as having asthma.

METHODS

A non-randomized clinical trial was designed to answer the question: *What effect does a school-based asthma education program have on the quality of life of children with asthma?* The primary outcome was child-reported asthma quality of life, as measured by the Paediatric Asthma Quality of Life Questionnaire (PAQLQ).¹⁵ The PAQLQ is a 23-item questionnaire for children 7 to 17 years of age, and asks about troublesome symptoms and activities, with each item answered on a 7-point Likert-type response set.¹⁵ Because there was no evidence from the literature of the effect size that might be expected for this outcome, it was not possible to accurately estimate the required sample size. Therefore, the initial trial was designed as a pilot study.

Principals of public elementary schools in East York were informed of the research study. Two principals volunteered to have their schools participate. These schools served 657 children and 495 children respectively, in grades one through five, were known to have a high level of cultural

TABLE I Number of Subjects Completing Study Components				
	Intervention Group		Control Group	
	Asthma	Non-Asthma	Asthma	Non-Asthma
Number Who Consented	30	200	14	129
Number Who Completed Baseline Data Collection	24 (80%)	74 (37%)	8 (57%)	57 (44%)
Number Who Received Intervention	17 (57%)	N/A	14* (100%)	N/A
Number Who Completed Follow-up Data Collection	14 (47%)	N/A	6 (43%)	N/A

Note: Percentage values indicate the proportion of consenting subjects completing each portion
 * The number of subjects who received the intervention in the control group exceeds the number completing baseline data collection because the intervention was written educational material, and this was shared with all consenting subjects.

TABLE II Demographics of Study Participants with Asthma			
	Intervention Group (n=24)		Control Group (n=8)
Mean Age (standard deviation) and Range	8.6 (1.7)	Range 5.9 to 10.8	8.7 (1.6) Range 5.9 to 10.1
Asthma Severity Distribution	Minimal	1	Minimal 1
	Mild	16	Mild 7
	Moderate	5	Moderate 0
	Severe	2	Severe 0
Proportion of Children Born in Canada	52%		65%
Proportion of Mothers Born in Canada	7%		27%
Proportion Living in High-rise Dwellings	98%		62%
Proportion Living with Both Parents	85%		77%
Predominant Language at Home	English	29%	English 45%
	Urdu	29%	Serbian 11%
	Gujarati	12%	Cantonese 7%
	Tamil	7%	Bulgarian 5%
			Tamil 4%

TABLE III Changes in PAQLQ Scores from Baseline to Follow-up						
Variable	Intervention Group (School-Based Asthma Education Program)			Control Group (Written Educational Materials)		
	Mean Change	Std. Dev. of Change	Effect Size	Mean Change	Std. Dev. of Change	Effect Size
Activity Sub-Domain	-0.015	1.552	-0.010	-0.280	2.368	-0.118
Symptom Sub-Domain	+0.231	1.252	+0.185	-0.700	2.016	-0.347
Emotion Sub-Domain	+0.131	0.928	+0.141	-0.260	1.191	-0.218
Aggregated QOL Score	+0.138	1.122	+0.123	-0.440	1.753	-0.251

Note: higher scores indicate better quality of life.

diversity, and had a high proportion of parents for whom English was not their first language. It was recognized that educating this population might pose substantial challenges, however, this risk was offset by the greater need for asthma education in this population. Several precautions were taken to address the diversity of languages spoken in these populations. For example, information consent forms were translated into all languages spoken by more than 10% of the population, and the support of the local community centre was enlisted to assist families with data collection.

Ethics approval was obtained from the Hospital for Sick Children and the East

York School Board. Information letters, consent forms and assent forms were sent home to parents of all children in grades one to five in both schools. Parents were asked to participate and to indicate whether or not their child had ever been diagnosed with asthma.

Baseline data collection

All consenting children were given data collection packages by their teachers to take home and complete with their families. The packages contained Activities Scale for Kids (ASK) questionnaires (performance and capability versions),^{16,17} a questionnaire about their school atten-

dance and use of health services. Those with asthma were also given a PAQLQ. Both the ASK and PAQLQ are valid in comparison to other related measures and are reliable, with test retest intraclass correlation coefficients ≥ 0.95 .^{15,18,19} The ASK was included to assess whether the physical function levels differed between children with asthma and their peers. The PAQLQ was included to permit the detection of subtle changes in disease-specific quality of life associated with the educational intervention. The PAQLQ sub-domain scores were aggregated as the average of items, and the overall score equals the average of the sub-domain scores.

Intervention group treatment

Following the collection of baseline data, children with asthma who attended the intervention school and their parents were enrolled in the Air Force Program. The sessions were provided at no charge to the participants, and free day care was provided on site for other children in the family. The program was delivered on sequential Monday evenings at the school for four weeks. At each session the children and their parents watched a video about asthma. Children were then taken to a different room where they discussed the video, asthma etiology, and asthma management with the help of a nurse-facilitator.

Concurrently, parents attended a presentation and question and answer session with a paediatric asthma specialist. The specialist and the aspect of etiology or management were different for each session.

Control group treatment

At the same time, children with asthma who attended the control school and their parents were provided with a package of educational pamphlets from the Lung Association. They received no other education.

Peer group treatment

Consenting children at both schools, who did not have asthma, were included in the initial data collection only. This data provided a reference group or "peer group" with which to compare. No interventions were provided to these children.

Follow-up data collection

Six weeks after the intervention was completed, all families of children in the intervention and control groups were sent a second data collection package. The packages contained a PAQLQ, and a questionnaire about use of health services and school attendance. School attendance records were also obtained from the schools. Parents were later contacted by phone to assess their level of satisfaction

with the program. All forms were numbered for tracking purposes, and were to be returned in a sealed envelope either to the school office, their teacher, or via postage-paid envelope to The Hospital for Sick Children.

RESULTS

A total of 657 and 495 children attended grades one to five at the intervention school and control school, respectively. Of these, 230 (35%) consented in the intervention school and 143 (29%) consented in the control school. The prevalence of asthma among consenting students was 13% in the intervention school and 10% in the control school.

The numbers completing baseline data collection, the SBAEP intervention, and follow-up data collection are shown in Table I. Demographics for those completing baseline data collection are shown in Table II.

Primary analysis

The main question asked in this research was: *What effect does a school-based asthma education program have on the quality of life of children with asthma?* Due to the pilot nature of this study, the analysis sought trends rather than statistical significance.

Figures 1 and 2 present detailed information on the changes in sub-domain scores on the PAQLQ for the children with asthma. Figure 1 shows that there were clinically important improvements (i.e., those in which the magnitude of the change in the intervention group compared to that in the control group exceeded 0.5 points on the 7-point scale – in this case, a change of +0.138 points concurrent with a change of -0.440 in the control group²⁰) in the PAQLQ summary score and the symptom sub-domain scores for children in the intervention group. During this same period PAQLQ scores in the control group tended to worsen. Table III shows the effect sizes associated with these changes in PAQLQ scores. Note that all changes were of small magnitude, with none above 0.2 standard deviation units, and none reaching statistical significance.

The ASK scores for children with asthma (intervention and control groups com-

bined) and their peers who do not have asthma are shown in Figure 3. This figure demonstrates that children with asthma are no more restricted in physical activities than their peers, many of whom were healthy.

Secondary analyses

Assessment of attendance and health services use found no consistent improvements related to the intervention. However, there were differences between children with asthma when compared to their peers, with more frequent doctor visits (mean of 0.86 vs. 0.23 visits per month), and more days of hospitalization in the previous year (mean of 0.33 vs. 0.02 days) for those with asthma. These findings are consistent with previous reports of higher health services utilization among children with asthma.

Satisfaction with the Air Force Program was high, with all respondents being either satisfied (33%) or very satisfied (66%). All but one reported no trouble understanding the information, 66% reported they made changes in their management of their child's condition and that their children enjoyed the program. Most importantly, 80% of parents had noticed a change in their child's asthma-related knowledge or behaviour. In contrast, only 28% of parents in the control group remembered receiving the written information they had been sent six weeks earlier, and were not able to attribute changes to this material. However, these parents did report they valued the information.

General observations

Several important observations were made during this study that are worthy of reporting. First, the study groups were both very culturally diverse, with a large proportion of recent immigrants. This resulted in many of the children having better written communications skills in English than their parents. However, families were generally very resourceful and were able to gain assistance with data collection forms from the local community centre and neighbours.

Second, we observed discrepancies between those reported as having a diagnosis of asthma and the responses parents

gave to questions related to asthma symptoms. Data quality may potentially be enhanced by better case identification strategies. Similarly, better collection of medication data would have been useful (e.g., by using a colour-coded chart to indicate the types of inhaled medication).

Third, we noticed that it was the children who were keen to attend and encouraged their parents. Reluctance on the part of some parents to attend formal sessions was related to employment and to parent-ing responsibilities for other children.

Finally, we observed that some of the content of the videotapes required updating.

DISCUSSION

This study has enabled us to predict the sample size for future trials to assess the effectiveness of this type of asthma education program. We now know that the largest effects will occur in the symptom sub-domain of the PAQLQ, and will approach an effect size of 0.2 standard

deviation units. The effect size for the PAQLQ summary score was 0.12. These represent very small effect and will require a large sample size to prove statistically significant improvement due to education alone.

However, the education sessions appear to have resulted in subjective improvements in health behaviours and knowledge, and the majority of participants were satisfied with the sessions. Moreover, education is relatively inexpensive compared to medical care, so even modest improvements in quality of life may be considered worthwhile.

The main limitation of this study was its small sample size. This was due in part to its pilot nature, but was exacerbated by a poor response rate. The main recommendation for future trials is to inflate the number of students approached to ensure a larger consenting population, and to consider beginning the program during regular classroom time. It appeared that the requirement of parental involvement throughout the program was a limiting factor for some families.

CONCLUSIONS

The Air Force Program for educating children with asthma and their families has a small but clinically important effect. Since the cost of the intervention is minimal, and it is not associated with risk, further investigation is warranted. It was advantageous to deliver it through the local

schools. It should be targeted at those with the fewest external resources for learning to manage their asthma, and should be updated prior to initiating a full-scale randomized controlled trial. Evidence from this study may be helpful in identifying areas of improvement for the program (e.g., to address multi-cultural diversity).

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