

A preliminary study to evaluate a patient-centred asthma education programme on parental control of home environment and asthma signs and symptoms in children with moderate-to-severe asthma

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Aims and objectives. To evaluate the effectiveness of a nurse-led patient-centred asthma education programme on home environmental control behaviours of parents of children with moderate or severe asthma.

Background. Reducing allergic triggers is important self-management behaviour for preventing asthma attacks and patient-centred asthma education has been shown to effectively manage chronic disease.

Design. A preliminary quasi-experimental, non-equivalent control group design was used.

Method. Dyads ($n = 75$) of parents and their children with moderate or severe asthma (ages 6–14 years) were purposively recruited from the asthma clinics of two hospitals in central Taiwan. The experimental group of 38 children/parents from one hospital received patient-centred asthma education. The comparison group of 37 children/parents from the other hospital received routine individual education. At pretest and at the end of the three-month patient-centred asthma education programme, we measured parents' control of home environmental triggers, children's asthma signs/symptoms and children's pulmonary function. Data were analysed by the general linear model for repeat measures.

Results. The level of improvement in dust and cleaning methods was significantly greater among parents in the experimental group than among those in the comparison group ($p < 0.05$). Children with moderate or severe asthma in the experimental group had fewer signs/symptoms of asthma and better lung function than children in the comparison group.

Conclusions. Our patient-centred asthma education programme improved parents' home environmental control and children's asthma sign/symptoms and lung function.

Relevance to clinical practice. Nurses can play primary roles as patient educators in asthma clinics. Well-trained patient educators can continuously monitor self-management behaviours to improve patients' compliance with home environmental control, thus leading to better physical outcomes in children with asthma than routine individual asthma education alone.

Key words: childhood asthma, home environmental control, patient-centred education

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Introduction

During the past two decades, the prevalence of asthma among children has increased worldwide (Anderson *et al.*

2007, Pearce *et al.* 2007). In Taiwan, the prevalence rate among children has increased more than ten-fold during the same period. The prevalence rate of asthma was approximately 7.8% among adults (Kuo *et al.* 2003) and 7.4%

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among children (Chiang *et al.* 2007) in Taiwan. One causative factor or trigger for asthma in Taiwan is the high level of humidity (Yang *et al.* 1997, Su *et al.* 2001). House dust mite (HDM) allergens, which are common in high humidity environments, are a major cause of childhood asthma (Sun & Lue 2000, Lin *et al.* 2006). Thus, an important strategy for asthma management is environmental control of asthma triggers (National Heart, Lung and Blood Institute [NHLBI] 2007). Studies have shown that self-management and health education programmes based on the recommendations of international or national asthma treatment guidelines improve children's asthma sign/symptoms, increase the level of physical activity and reduce the doses of medications and school absenteeism in Taiwan (Hung *et al.* 2002, Chiang *et al.* 2004, Yang *et al.* 2005). In particular, good control or prevention of single or multiple triggers both outdoors and indoors has been shown to reduce the signs/symptoms of asthma and the number of hospital visits (Almqvist *et al.* 1999, Jones *et al.* 2001, Morgan *et al.* 2004, Eggleston *et al.* 2005). However, the compliance rate among parents and their children with controlling the home environment is still very low in Taiwan. Parents attribute their non-compliance to a lack of understanding about asthma medication, a lack of confidence in environmental controls, the cost of purchasing anti-mite products and doubts about the effectiveness of controlling the home environment in suburban areas (Chiang *et al.* 2005). Patient education is a major responsibility of nurses (Redman 2001). Paediatric nurses are responsible for teaching children with chronic disease and their family members the skills of self-care (Holaday *et al.* 1993). Nurses in asthma clinics teach children with asthma and their parents to comprehensively control their home environment to prevent allergy triggers and reduce exacerbation of asthma.

However, patient education is frequently disease centred rather than patient centred, especially when conducted by nurses without proper training (Close 1988). A patient-centred approach could improve patient's adherence (Robinson *et al.* 2008). This approach involves providing medical information adjusted to individual levels of understanding based on individualised teaching content and methods (Steward *et al.* 1995). Rather than teaching a patient everything about a particular disease, the clinical nurse should focus on what the patient needs to know to be an effective partner in his or her health care. Assessing the learning style of patients and then focusing teaching strategies to meet those individual styles can increase motivation, improve retention, make the teaching-learning session more effective (Chase 2001) and increase patient's compliance (Cordell *et al.* 1988, Hussey 1997, Rice 1999). A patient-centred approach is characterised by emphasising the individual patient, being

sensitive to the patient's preferences for information and shared decision making, developing common therapeutic goals, enhancing the personal bond between provider and patient and being aware of the influences of the practise qualities and subjectivity of the provider on the practise of medicine (Mead & Bower 2000). For example, one study increased patient's satisfaction by training nurses to have the competency of patient-centred teaching in providing information for patient receiving coronary artery bypass graft (CABG) (Bergvik *et al.* 2008).

Because nurses are responsible for promoting behaviours to control the home environment and for evaluating the effects of these behaviours on patients' asthma signs and symptoms, better strategies are needed to increase patients' adherence. Therefore, we hypothesised that a patient-centred education programme would be more effective at improving asthma morbidity than a routine education programme. To test this hypothesis, we compared the changes in home environmental control behaviours among parents and the level of improvement in asthma signs and symptoms among children between a parent/child dyad that received a patient-centred asthma education programme and a parent/child dyad that received routine asthma education.

Methods

Design and subjects

This study used a quasi-experimental, non-equivalent control group design. Subjects were recruited by purposive sampling from the asthma clinics of two medical centres in central Taiwan. The children ranged in age from 6–14 years, and all had clinically diagnosed moderate or severe asthma. The sample size was estimated at 30 subjects with two groups of 15 each, thus allowing comparison of group means with repeated measures for an effect size ($\gamma = 0.56$, significance $\alpha = 0.05$ and power = 0.8) (Stevens 2002). The final sample included 75 parents and their 75 children. The experimental group comprised 38 parents and their children who participated in a 12-week patient-centred asthma education programme conducted by a well-trained asthma education nurse. The comparison group comprised 37 parents and their children who received routine asthma education.

Parents and their children were assigned to groups according to the medical centre they visited. The asthma clinic at one medical centre agreed to accept the patient-centred asthma education programme with the second author as the asthma educator, who provided individual counselling and education for the children and their parents following a patient-centred approach. The clinic at the other

medical centre maintained its routine asthma education programme.

Outcome measures

Control of home environmental asthma triggers

Control of home environmental asthma triggers was measured by the Home Environmental Control Inventory (HECI), a self-report questionnaire designed by the researchers based on a comprehensive literature review and recommendations reported in the *Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma* (National Heart, Lung and Blood Institute, NHLBI 2007). The original HECI had 45 items and five domains: (1) Humidity Control, (2) Household Dust and Cleaning, (3) Allergen-Protective Products, (4) Exposure to Tobacco Smoke or Stimulating Odours and (5) Furry Pets or Other Triggers. The content validity of the HECI was examined by three immunologists and two paediatric nurses with experience in paediatric asthma. Based on the panel's suggestions, three items with content validity index (CVI) < 0.8 were deleted, and some words and phrases were modified. The final 42-item HECI includes five domains: (1) Humidity Control (nine items, CVI: 0.8–1.0), (2) Household Dust and Cleaning (nine items, CVI: 0.8–1.0), (3) Allergen-Protective Products (eight items, CVI: 0.8–1.0), (4) Exposure to Tobacco Smoke or Stimulating Odours (nine items, CVI: 1.0) and (5) Furry Pets or Other Triggers (seven items, CVI: 1.0). The internal consistency, as indexed by KR-20, of the HECI in a pilot study with 35 parents was 0.68.

The concurrent validity of the HECI was established in this study by the agreement between parents' subjective self-report and the researchers' observations on 42 items. The Pearson's product-moment correlation coefficients were $r = 0.87$ for the total HECI, $r = 0.94$ for Humidity Control, $r = 0.76$ for Household Dust and Cleaning, $r = 0.41$ for Allergen-Protective Products, $r = 0.76$ for Exposure to Tobacco Smoke or Stimulating Odours and $r = 0.95$ for Furry Pets or Other Triggers. The criterion validity of the HECI was determined by comparing parents' scores on the Humidity Control subscale with humidity measured by parents in 10 children's bedrooms every night at 8 PM for one week. The criterion validity (Pearson's product-moment correlation) was $r = -0.792$ ($p = 0.006$). The HECI thus had acceptable reliability and validity.

Asthma signs/symptoms

The self-report checklist of asthma signs/symptoms included four items: coughing, wheezing, dyspnea and interrupted sleeping at night time as a result of asthma signs/symptoms.

Parents scored the frequency of each asthma sign/symptom on a four-point scale using an asthma diary designed by the Bureau of Health Promotion in Taiwan (Department of Health, 2008). These scores were summed to assess asthma morbidity. Total scores could range from 4–16, with lower scores indicating better control of asthma signs and symptoms. The checklist of asthma signs/symptoms had an internal consistency (Cronbach's α) of 0.71 in this study.

Pulmonary function

Pulmonary function in children was measured each month at the clinic using Astech® peak flow metres (Dey, L.P., Napa, CA, USA). Concurrent validity was established by calculating the Pearson correlation coefficient (r). The result revealed that there was a high level of correlation between the peak expiratory flow rate (PEFR) and asthma signs/symptoms scores ($r = -0.313$; $p < 0.05$). All participants had been taught how to use the peak flow metre properly prior to the start of the study. PEFR data were measured three times, and the best score of the three was selected and recorded.

Study procedures

The study protocol was approved by the institutional review boards of the two medical centres where the participants were recruited before commencement of the study. Informed consent was obtained from each parent. Parents and children in the experimental group received the patient-centred asthma education, and those in the comparison group received routine asthma education. Parents in the two groups self-reported their behaviours (HECI), their child's asthma signs/symptoms and collected PEFR data before the intervention (pretest) and during the three months of the asthma education programme. A comparison of the two teaching programmes is given in Table 1.

The patient-centred asthma education programme

Asthma education in the experimental group comprised a comprehensive individual teaching process: recruitment, monitoring, implementation, evaluation and follow-up. Every procedure was supported by the asthma educator and partnered with the children and their parents (Tzeng & Chiang 2005). The programme focused on educating parents to monitor continuously the behaviours necessary to avoid home environmental allergens and triggers. Thus, the programme introduced parents to methods of humidity control; methods to effectively clean and reduce dust; the importance of using mite-protective covers for bedding and pillows and of cleaning them with hot water every two

Table 1 Comparison the two different asthma education programmes

	Patient-centred asthma education	Routine asthma education
Teaching style	Patient-centred Continuous teaching Partnership	Disease-centred One-time teaching Passive learning
Education content	Introduction of asthma self-management by asthma educator when children visiting the asthma clinics Asthma self-management including control their home environment, how to take medications, and how to monitor PEFR with a peak flow metre Learning the asthma self-management from the asthma teaching book from first visiting and later	Introduction of asthma self-management by asthma educator when children visiting the asthma clinics Asthma self-management including control their home environment, how to take medications, and how to monitor PEFR with a peak flow metre
Teaching materials	Asthma booklet Peak flow metre	Asthma booklet Peak flow metre
Teaching method	Introduce the nature of asthma, asthma medication, environmental control and peak flow metre monitoring by mutual dialogue discussion Discuss the home environmental control with parents Partnership and empowering, parents were encouraged to (a) identify needs and concerns, (b) use existing strengths and capabilities to meet needs, (c) identify and use their primary sources of social support, (d) work in partnership with professionals	Introduce the nature of asthma, asthma medication, environmental control and peak flow metre monitoring by lecturing
Follow-up	Every week by telephone Every month in clinics	Every month in clinics

weeks; the importance of avoiding exposure to tobacco smoke and stimulating odours; the reasons for avoiding fluffy toys and furry pets; and how to reduce exposure to cockroaches and rats in the house.

While conducting the patient-centred asthma education programme, the asthma educator established parent-professional partnerships and implemented the empowering process. The empowering approach followed the principles described by Dunst *et al.* (1994) and McCarthy *et al.* (2002). The parents were encouraged to (1) identify needs and concerns, (2) use existing strengths and capabilities to meet needs, (3) identify and use their primary sources of social support and (4) work in partnership with professionals. The asthma educator stressed the parents' responsibility for self-monitoring environmental control behaviours and self-managing their child's asthma attacks. Simultaneously, the parents were encouraged to explore their questions, impressions and concerns. A mutually interactive process was used to solve the problems parents had with controlling the home environment. Continuous repetition and review of the parents' home environmental control behaviours were monitored by the asthma educator. During the visits to the asthma clinic, the asthma educator evaluated changes in parents' self-management behaviours and evaluated the effectiveness of home environmental control by measuring the child's pulmonary function. During the study, the asthma educator

telephoned parents on a weekly basis to promote their compliance with suggested home environmental control behaviours. In the experimental group, the methods by which participants could improve control of the home environment were reinforced at least five times in the asthma clinic and at least ten times over the telephone.

Routine asthma education programme

The routine asthma education programme was conducted according to the guidelines established by the Bureau of Health Promotion in Taiwan. Each patient received an asthma booklet on how to control their home environment, how to take medications and how to monitor PEFR with a peak flow metre. Each section of the booklet was explained by an asthma education nurse, often several times. During the routine asthma education process, the parents always were passive learners and nurse lecturers were portrayed as the experts.

Data analysis

All data were analysed using SPSS for windows (version 12.0). Demographic characteristics were analysed by descriptive statistics. The homogeneity of characteristics in the experimental and comparison groups was examined by

inferential statistics, i.e., chi-square and independent *t*-test (two tailed). The effectiveness of the patient-centred asthma education programme was evaluated by comparing HECI scores of parents in the two groups using the general linear model (GLM) for repeat measures.

Results

Participants' demographic data

The experimental group comprised 38 children [24 boys (63.2%) and 14 girls (36.8%)] and the comparison group comprised 37 children [18 boys (48.6%) and 19 girls (51.4%)]. In the experimental group, 22 children had moderate asthma and 16 children had severe asthma; in the comparison group, 17 children had moderate asthma and 20 children had severe asthma (Table 2). The severity of asthma at pretest was diagnosed by physicians according to the signs/symptoms of asthma and the IgE index for HDM and other allergens. The largest proportion of children in each group was seven years old and almost half the children in each group had a family history of asthma (44.7% in the

experimental group and 40.6% in the comparison group). In the experimental group, eight children had an IgE index <250, and 21 children had an IgE index ≥250. In the comparison group, five children had an IgE index <250, and 14 children had an IgE index ≥250. The only characteristic that differed significantly between the experimental and comparison groups was the children's height. The average height of children in the experimental group was 136.46 cm and that in the comparison group was 130.74 cm (*t* = 2.112, *p* = 0.038).

The characteristics of parents of these children with asthma are presented in Table 3. In the experimental group, three fathers and 33 mothers received the patient-centred asthma education programme; in the comparison group, nine fathers and 24 mothers received routine asthma education care. The socioeconomic status (SES, Hollingshead 1958) of the majority of parents in both groups was level III. In the experimental group, 22 parents reported having a family member who smoked tobacco; in the comparison group, 14 parents reported having a family member who smoked tobacco. The average age of parents in the experimental group was 38.95 years, and the average

Table 2 Demographic characteristics of children with asthma (*n* = 75)

	Experimental group (<i>n</i> = 38)		Comparison group (<i>n</i> = 37)		χ^2/t	<i>p</i>
	<i>n</i> (%)	Mean ± SD	<i>n</i> (%)	Mean ± SD		
Gender						
Male	24 (63.2)		18 (48.6)		$\chi^2 = 1.602$	0.249
Female	14 (36.8)		19 (51.4)			
Severity						
Moderate	22 (57.9)		17 (45.9)		$\chi^2 = 1.072$	0.359
Severe	16 (42.1)		20 (54.1)			
Age (years)						
6	3 (7.9)		6 (16.3)		$\chi^2 = 8.777$	0.361
7	8 (21.1)		10 (27.0)			
8	5 (13.2)		7 (18.9)			
9	5 (13.2)		5 (13.5)			
10	6 (15.8)		4 (10.8)			
11	7 (18.4)		1 (2.7)			
≥12	4 (10.5)		4 (10.8)			
IgE						
<250	8 (21.0)		5 (13.5)		$\chi^2 = 0.009$	0.923
≥250	21 (55.3)		14 (37.8)			
Missing	9 (23.7)		18 (48.7)			
Asthma history						
Yes	17 (44.7)		15 (40.6)		$\chi^2 = 0.746$	0.388
No	14 (36.9)		19 (51.4)			
Missing	7 (18.4)		3 (8.0)			
Height (cm)		136.46 ± 12.41		130.7 ± 10.65	<i>t</i> = 2.112	0.038
Weight (kg)		33.61 ± 8.63		31.53 ± 8.90	<i>t</i> = 1.020	0.311
IgE index		734.3 ± 649.5		840.8 ± 769.7	<i>t</i> = -0.516	0.608

Table 3 Demographic characteristics of parents of children with asthma ($n = 75$)

	Experimental group ($n = 38$)		Comparison group ($n = 37$)		χ^2/t	p
	n (%)	Mean $\pm$ SD	n (%)	Mean $\pm$ SD		
Caregivers						
Fathers	3 (7.9)		9 (24.3)		$\chi^2 = 5.075$	0.079
Mothers	33 (86.8)		24 (64.9)			
Other*	2 (5.3)		4 (10.8)			
Tobacco smoking						
Yes	22 (57.9)		14 (37.8)		$\chi^2 = 0.820$	0.365
No	15 (39.5)		15 (40.5)			
Missing	1 (2.6)		8 (21.7)			
SES level†						
SES I	1 (2.6)		1 (2.8)		$\chi^2 = 2.919$	0.571
SES II	8 (21.1)		4 (10.8)			
SES III	17 (44.7)		12 (32.4)			
SES IX	8 (21.1)		12 (32.4)			
SES V	3 (7.9)		4 (10.8)			
Missing	1 (2.6)		4 (10.8)			
Age (years)		38.95 $\pm$ 5.90		42.17 $\pm$ 9.28	$t = -1.740$	0.087

$p < 0.05$ (two tailed).

$p < 0.01$ (two tailed).

*Others were grandfathers, grandmothers, aunts or uncles of children with asthma.

†Socioeconomic status (SES) levels were discriminated according to Hollingshead (1958). Five levels were discriminated by the total of [Education (levels) $\times$ 4] + [Occupation (levels) $\times$ 7].

age of parents in the comparison group was 42.17 years. As shown in Table 3, there were no significant differences between age, gender, SES level or tobacco-smoking behaviours, indicating that the characteristics of the two groups were homogeneous.

Home environmental control before the intervention

At pretest, 66.97% of parents (range, 46.7–92%) correctly controlled the humidity in their home. The methods included opening windows for fresh air and keeping the bathroom and porch dry to reduce the humidity level; however, fewer than 50% of parents used a dehumidifier to reduce the humidity level or an air filtering machine to clean indoor air.

The majority of parents poorly controlled the household dust level and improperly cleaned their homes. Only 43% of parents cleaned the house with a vacuum cleaner rather than a mop or broom, and only 47% of parents cleaned the window screens every week. Only 35% of parents used mite-protection products to reduce the level of exposure to HDM, and only 23% cleaned the bedding or pillow covers with hot water. Most families did not use blankets, curtains or sofas of cotton material.

Like most families in Taiwan, about half of the parents burned incense sticks and paper on the family altar for religious purposes and used slow-burning insecticide coils in

the house. The majority of children (63%) in this study had fluffy toys and 20% of families had furry pets.

Effect of the patient-centred asthma education programme on home environmental control

The overall effect of the patient-centred asthma education programme on parents' control of the home environment was analysed by measuring the group effect, the time effect and the interaction between the group and time effects.

The results in Table 4 illustrate that there was a significant interaction between the group effect and the time effect ($F_{IN} = 5.36$, $p = 0.023$) on Household Dust and Cleaning after the patient-centred asthma education programme (Fig. 1). Total HECI scores ($F_{IN} = 0.159$, $p = 0.691$), Humidity Control ($F_{IN} = 2.40$, $p = 0.126$), Allergen-Protective Products ($F_{IN} = 0.039$, $p = 0.854$), Exposure to Tobacco Smoke or Stimulating Odours ($F_{IN} = 3.575$, $p = 0.063$) and Furry Pets or Other Triggers ($F_{IN} = 0.161$, $p = 0.689$) did not have a significant impact on the interaction between the group effect and the time effect after the patient-centred asthma education programme.

Evaluation of the HECI in the experimental group after the patient-centred asthma education programme revealed that parents made significant improvements in reducing smoking in the house (50.7–29.3%), removing carpet (65.79–84.21%),

Table 4 Effect of the patient-centred asthma education on home environmental control

Domain	<i>n</i>	Pretest mean $\pm$ SD	Posttest mean $\pm$ SD	Group F_G (<i>p</i>)	Time F_T (<i>p</i>)	Interaction (group $\times$ time) F_{IN} (<i>p</i>)
Total HECI	E (<i>n</i> = 38) C (<i>n</i> = 37)	25.68 $\pm$ 4.56 27.65 $\pm$ 4.49	28.05 $\pm$ 4.39 30.43 $\pm$ 4.33	6.037 (0.016)	24.46 (0.000)	0.159 (0.691)
Humidity control	E (<i>n</i> = 38) C (<i>n</i> = 37)	5.61 $\pm$ 1.72 6.46 $\pm$ 1.69	5.97 $\pm$ 1.92 7.30 $\pm$ 1.49	8.87 (0.004)	15.82 (0.000)	2.40 (0.126)
Household dust and cleaning	E (<i>n</i> = 38) C (<i>n</i> = 37)	4.03 $\pm$ 1.64 4.46 $\pm$ 1.46	4.63 $\pm$ 1.46 4.22 $\pm$ 1.13	0.001 (0.974)	0.975 (0.327)	5.358 (0.023)
Allergen-protective products	E (<i>n</i> = 38) C (<i>n</i> = 37)	4.84 $\pm$ 1.33 4.81 $\pm$ 1.35	5.39 $\pm$ 1.28 5.30 $\pm$ 1.20	0.068 (0.795)	9.556 (0.003)	0.039 (0.854)
Tobacco smoke or odours	E (<i>n</i> = 38) C (<i>n</i> = 37)	5.61 $\pm$ 1.82 6.08 $\pm$ 1.88	6.29 $\pm$ 1.54 7.49 $\pm$ 1.61	5.78 (0.019)	30.01 (0.000)	3.575 (0.063)
Furry pets or other triggers	E (<i>n</i> = 38) C (<i>n</i> = 37)	5.61 $\pm$ 1.15 5.84 $\pm$ 1.26	5.76 $\pm$ 1.02 6.14 $\pm$ 1.38	1.910 (0.171)	1.721 (0.194)	0.161 (0.689)

E, experimental group received patient-centred asthma education; C, comparison group received routine asthma education.

removing curtains in the house (47.37–73.68%) and reducing the use of chemical detergents (7.89–47.73%).

Effect of the patient-centred asthma education programme on asthma signs/symptoms

After the intervention, children in the experimental group showed more improvement in asthma signs/symptoms scores (9.51–6.92) than children in the comparison group (8.83–8.03), with a significant interaction between the group effect and the time effect ($F_{IN} = 5.956$, $p = 0.017$). In addition, the mean PEFR of children in the experimental group (206.9–266.5 l/minute) was significantly higher than that in children in the comparison group after the intervention (201.8–218.2 l/minute), with a significant interaction between the

group effect and the time effect ($F_{IN} = 6.648$, $p = 0.012$) (Table 5, Figs 2 and 3).

Discussion

The results of this preliminary study show that the patient-centred asthma education programme significantly improved parents' household dust and cleaning behaviours relative to the pretest and to the comparison group. At the pretest, the mean Household Dust and Cleaning score of parents in the experimental group was lower than that of parents in the comparison group. After participating in the patient-centred asthma education programme for three months, the mean Household Dust and Cleaning score was significantly higher in the experimental group than in the comparison group. The behaviours that improved most were related to preventing dust and house cleaning, including reducing the use of chemical detergents, avoiding paints that contain airway irritants, reducing the frequency of hanging clothes outside the house and closing windows during periods of windy weather. Although most behaviours improved, the most significant improvement was the reduction in the use of chemical detergents.

The mean relative humidity in central Taiwan is approximately 78% (Central Weather Bureau 2008), a factor that contributes to the rapid growth of mites and mould on the island (Huss *et al.* 2003). Reducing the relative humidity in the home can reduce the symptoms of asthma (Wickman *et al.* 2002). Important equipment for reducing allergens in the home includes dehumidifiers, air-filtering machines, humidity metres, vacuum cleaners and mite-protective products. In Taiwan, owning such home environmental equipment for managing childhood asthma depends on the parents'

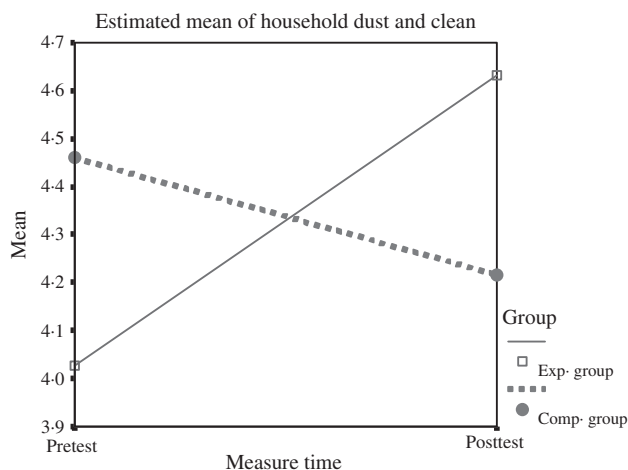


Figure 1 Effectiveness of household dust and cleaning after patient-centred asthma education.

Table 5 Effect of patient-centred asthma education on asthmatic signs and symptoms

Category	<i>n</i>	Pretest mean $\pm$ SD	Posttest mean $\pm$ SD	Group F_G (<i>p</i>)	Time F_T (<i>p</i>)	Interaction (group $\times$ time) F_{IN} (<i>p</i>)
Score for asthma signs/symptoms	E (<i>n</i> = 38)	9.51 $\pm$ 2.66	6.92 $\pm$ 1.59	0.285 (0.595)	0.002 (0.967)	5.956 (0.017)
	C (<i>n</i> = 37)	8.83 $\pm$ 2.32	8.03 $\pm$ 2.26			
PEFR	E (<i>n</i> = 37)	206.9 $\pm$ 65.7	266.5 $\pm$ 73.2	0.876 (0.353)	1.995 (0.162)	6.648 (0.012)
	C (<i>n</i> = 37)	201.8 $\pm$ 49.3	218.2 $\pm$ 56.7			

E, experimental group received patient-centred asthma education; C, comparison group received routine asthma education; PEFR, peak expiratory flow rate.

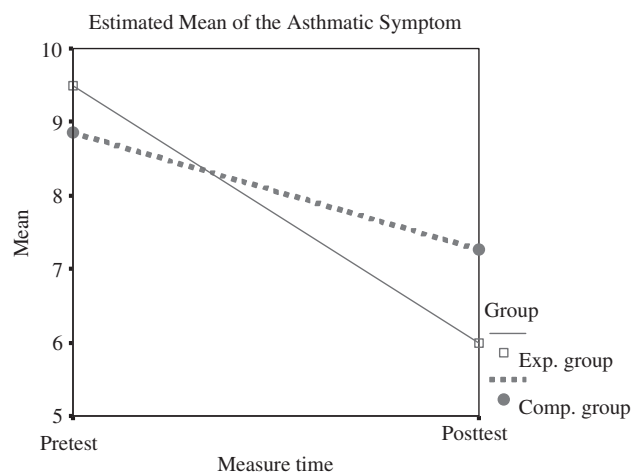


Figure 2 Improvements of asthma signs/symptoms after patient-centred asthma education.

socioeconomic status (SES) level (Chiang *et al.* 2005). Considering the SES level of parents' in this study, it is not surprising that few parents had equipment for managing their child's asthma. Instead, the majority of parents reduced the level of allergens by other means, such as cleaning and keeping the bathroom dry, removing mold if they saw it, reducing the number of fluffy toys and pets and cleaning the house with wet wipes.

After participating in the patient-centred asthma education programme, the self-reported smoking rate among parents decreased from 50.7–29.3%. This finding is significant because tobacco smoke is a well-known trigger for asthma attacks (Goodwin & Cowles 2008). Whether the decline in the smoking rate was a result of the parents' social acceptability in this study is not clear. However, we can only trust the parents' self-report. Collecting data directly via observational methods in the patient's house might be designed in the future.

Among the 20% of families with furry pets in the home at pretest, only 8% changed their behaviour by keeping the pet outside at post-test, as recommended by experts (Huss *et al.* 2003, Dong *et al.* 2008). Although a study revealed that

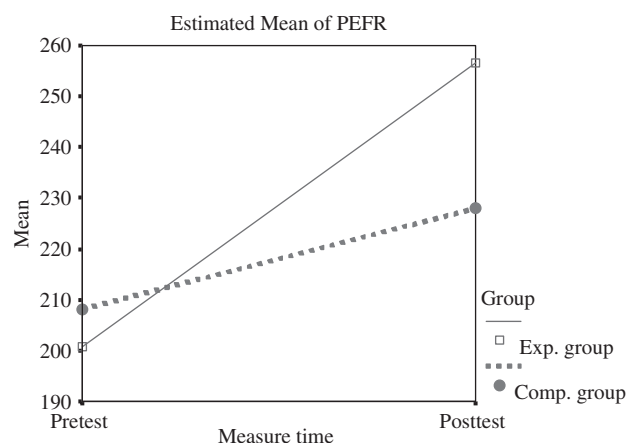


Figure 3 Improvement of PEFR after patient-centred asthma education.

reduction of animal allergens in the home does not significantly improve asthma control (Wood *et al.* 1998), keeping furry pets outdoors was recommended by experts. More efficient teaching strategies should be developed in the future.

Asthma signs/symptoms and pulmonary function improved significantly in children who participated in the patient-centred asthma education programme. The patient-centred education programme offered comprehensive care and stressed responsibility for self-monitoring and self-management. The asthma educator provided every child with a peak-flow metre, taught them the proper way to use it and followed up on improvement in parameters at every clinic visit or by frequent telephone calls. Our data revealed that the signs/symptoms of coughing, wheezing, dyspnea and interrupted sleeping because of asthma signs/symptoms significantly decreased as control of the home environment improved and PEFR increased. There was less improvement in PEFR in the comparison group, because the severity of asthma was greater in that group, thereby limiting the extent to which the PEFR could improve.

Although our preliminary results showed that the three-month patient-centred asthma education programme effectively improved parents' control of the home environment,

reduced children's signs/symptoms of asthma and improved children's lung function, the study has some limitations. First, the sample was drawn from central Taiwan, preventing generalisation of the results to children with asthma and their families from other parts of Taiwan and other countries. Second, to reduce the contamination of treatments, the patient-centred asthma education programme was performed in only one hospital; therefore, the participants were not randomly assigned to the two different groups.

Conclusion

Participation in the three-month patient-centred asthma education programme effectively improved the home environmental control behaviours of parents of children with asthma. In particular, there was a significant interaction between the mean score for Dust and Cleaning Methods and the time and group effects. In children who received the patient-centred asthma education, pulmonary function and asthma signs/symptoms had a significant interaction of time and group effect. The patient-centred asthma education programme included assessment, individualised planning, coordination, referral, monitoring and follow-up. Involvement of the asthma educator with clients not only improved the nurse–client partnership, but also empowered the parents to change their behaviour and improve the health outcomes of their children.

Relevance to clinical practice

Nurses play primary roles as patient educators in asthma clinics. Well-trained nurses can provide patient-centred care by continuously monitoring self-management behaviours to motivate parents to modify the home environment, thus leading to better outcomes for children with asthma than routine asthma education alone. Based on our findings, a patient-centred asthma education programme can lessen the asthma morbidity and improve children's lung function. However, this is a preliminary quasi-experimental study to examine the effects of a patient-centred asthma education programme in one hospital; the method could be verified with multi-site randomised cluster trials in more hospitals by extending the sample size and using the Intra-Cluster Correlation (ICC) to control for the site effects in the future.

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Contributions

Study design: LCC, LFT; data collection and analysis: LFT, KCH, LSF, LCC; manuscript preparation: LFT, LCC, WFM.

Conflict of interest

None.

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