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Long-term effects of asthma education for physicians on patient satisfaction and use of health services

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Long-term effects of asthma education for physicians on patient satisfaction and use of health services. N.M. Clark, M. Gong, M.A. Schork, N. Kaciroti, D. Evans, D. Roloff, M. Hurwitz, L.A. Maiman, R.B. Mellins. ©ERS Journals Ltd 2000.

ABSTRACT: This randomized clinical trial evaluated the long-term impact of an interactive seminar for physicians based on principles of self-regulation on clinician behaviour, children's use of health services for asthma, and parent's views of physician performance.

Seventy-four general practice paediatricians, and 637 of their asthma patients aged 1–12 yrs, were randomized to treatment or control. Children and parents were blind to physicians' participation. Data were collected at baseline and follow-up through self-administered surveys (paediatricians), telephone interviews (parents) and medical records. The seminar focused on development of communication and teaching skills and use of therapeutic medical regimens for asthma as outlined in the National Asthma Education and Prevention Program guidelines.

Approximately 2 yrs postintervention, treatment group physicians were more likely than control physicians to: use protocols for delivering asthma education (odds ratio (OR) 4.9, p=0.2), write down for patients how to adjust medicines when symptoms change (OR 5.7, p=0.05), and provide more guidelines for modifying therapy (OR 3.8, p=0.06). Parents scored treatment group physicians higher than control physicians on five specific positive communication behaviours. Children seen by treatment group physicians had fewer hospitalizations (p=0.03) and those with higher levels of emergency department (ED) use at baseline had fewer subsequent ED visits (p=0.03). No differences regarding the number of office visits were noted. There were no significant differences found between treatment and control group physicians in the amount of time spent with patients during office visits (26 *versus* 29 min) or in the number of patients treated with anti-inflammatory medicine.

It is concluded that interactive asthma seminars for paediatricians had significant long-term benefits for their asthma care.

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Annual expenditure by individuals, professional societies, and corporations on professional education are considerable as this form of learning is thought to be a major way in which physicians keep abreast of changes in clinical practice. Nonetheless, little information evaluated by randomized controlled study designs exists in the literature about the impact of education for practicing physicians on the health status of their patients. While studies of continuing medical education are rare [1–3], fewer still are available to assess the persistence or decline of effects over the longer term. Developing potent interventions for clinicians, that change their practices and result in desirable patient outcomes, is important for ultimately improving healthcare and reducing costs.

There are at least three reasons for why providing effective continuing education is salient in asthma control. Firstly, a chronic disease like asthma requires an ongoing partnership between clinician and patient and the nature of that relationship has only recently received attention in research [4]. Not all physicians are aware of the elements of partnership (for example communication techniques, teaching skills) that can enhance their clinical practice. Secondly, there is a need for physicians seeing asthma patients to employ new medical therapies, especially those providing control over inflammatory processes (*e.g.* corticosteroids). Thirdly, clinicians need to change the way they work to take advantage of knowledge gleaned from current research regarding the patient's self-management of asthma. Findings of recent social-behavioural studies have provided a reasonably robust picture of the elements of patient self-management and the information and skill that patients require in order to be successful [5].

This paper presents findings on the long-term effects of a self-regulation intervention. Baseline scores are compared to final data collected on average 2 yrs subsequent to the programme, that is, following physicians' participation in the education.

Methods

Study sample

The sample of paediatricians was drawn from individuals practicing in the environs of Ann Arbor, MI,USA

and New York, NY, USA. Letters were sent to 1,276 practitioners identified from the rosters of the American Medical Association Directory, American Academy of Paediatrics Fellowship Directory, American Board of Medical Specialities Directory, and the yellow-page listings for paediatricians (in Ann Arbor) inviting them to participate. To control for effects of group practice culture, only one physician in a practice group could participate. In addition, those enrolled had to: have general paediatrics as the primary speciality; be licensed no earlier than 1960; provide direct patient care; if board specialized, be certified only in paediatrics; and be willing to take part in the interactive seminar if randomized to the treatment group. A total of 285 physicians responded to the invitation letters. Eighty-three paediatricians met all criteria and, of these, 74 agreed to provide access to a sample of their asthma patients. The clinician group comprised a convenience sample of physicians who were not necessarily representative of the population of practicing paediatricians but were likely to be similar to other paediatricians who would participate in continuing education and be open to participation in university based research.

The children enrolled in the study met the following criteria: 1–12 yrs of age; diagnosis of asthma made by a physician; no other chronic disorders with pulmonary complications; and at least one emergency medical visit for asthma in the previous year. An emergency visit was a hospitalization, emergency department (ED) visit, or physician office visit on an emergency basis defined as requiring administration of adrenalin *s.c.* or bronchodilators by aerosol. Physicians provided patient rosters of 1,067 children fulfilling these criteria. If less than six names were on a physician′s roster, attempts were made to enrol all of these children in the study. If more than six names were provided, children were selected by use of a random numbers table. A total of 701 names were identified through these processes and, subsequently, 637 parents (one per family) agreed to participate in the study. On average, ten patients per physician agreed to participate in the study and provided data, with a range 1–33. The patients comprise a random sample of children from across the 74 practices that fit study criteria. Patients and their parents were blind to physicians′ participation in the study. Physicians received no information concerning the questions to be addressed to their patients.

Following collection of physician baseline data, 38 physicians were randomized to the experimental group and 36 were randomized to a control group. Patients followed their physician with 336 in the experimental group and 301 in the control group.

The intervention

The interactive seminar was based on the theory of self-regulation [6, 7], guiding physicians to examine their own behaviour and to identify ways that they could develop a better partnership with their patients. Physicians were retrained to observe, evaluate, and react to their own efforts to treat and educate their patients. Specifically, the training: 1) used interactive methods; and 2) focused on helping physicians to create conversation between themselves and the patients to promote partnership by building the following: 1) deriving information for making therapeutic decisions; 2) creating a congenial and supportive atmosphere so patients would be candid; 3) reinforcing positive efforts of families to self-manage; 4) providing a supportive climate for mutual problem-solving; 5) strengthening patients′ skills in using medicines; 6) providing the patient with a view of the long-term therapeutic plan; and 7) building patients′ confidence at controlling symptoms. The seminar organized patient teaching objectives and messages into a sequence that physicians could incorporate into one or more visits, depending on patients′ needs and the time available. The premises underlying the programme are discussed elsewhere [8].

There were two seminar components: optimal clinical practice based on National Asthma Education and Prevention Program (NAEPP) expert panel guidelines [4], and patient teaching and communication. Several activities and materials were used in the seminar to convey concepts and enable acquisition of skills. These included: brief lectures on clinical practice from respected asthma specialists; a video tape depicting effective clinician teaching and communication behaviour [9] (outlined in table 1); case studies presenting troublesome clinical problems; a protocol by which physicians could assess their communications with patients; and review of messages and materials to provide when teaching patients. These topics included: what happens in an asthma attack; how medicines work; responding to changes in asthma severity; how to take medicines; safety of medicines; goals of therapy; criteria of successful treatment; managing asthma at school; and identifying and avoiding triggers. A long-term treatment plan showing patients how to adjust medication use (as required) at home was also presented in the seminar [10]. The seminar comprised two face-to-face group meetings lasting ~2.5 h each held over a 2–3 week period for up to 12 physicians (average attendance, 10). While the seminar format and focus on self-regulation is innovative, the time frame was designed to be similar to conventional continuing education programmes provided by professional societies and healthcare facilities so that, if successful, it could fit easily into a post-graduate medical education delivery system.

Data collection and study design

All physicians and parents were interviewed at baseline, mid-point and final evaluation. Physicians completed self-administered postal surveys, and trained telephone questionnaire administrators, who were closely monitored by a supervisor, interviewed parents at home. After baseline

Table 1. – The teaching and communication behaviours emphasized in the seminar

1. Show nonverbal attentiveness
2. Give nonverbal encouragement
3. Give verbal praise for things done well
4. Maintain interactive conversation
5. Find out underlying worries/concerns
6. Give specific reassuring information
7. Tailor medication schedule to family′s routine
8. Reach agreement on a short-term goal
9. Review the long-term therapeutic plan
10. Help patient to use criteria for making decisions about asthma management

data collection, physicians were randomly assigned to programme or control status. Programme physicians then participated in the interactive seminar. In both Ann Arbor and New York, the seminars were offered three times over a 4-month period with enrolment in each seminar limited to 12. Control group physicians were randomly assigned a date corresponding to the date of one of the three seminars to determine when their mid-point interviews should begin. Programme group physicians completed mid-point evaluation surveys on average within 5 months of their participation in the seminar and control physicians within 5 months of their assigned corresponding date. The first asthma visit each patient made to their physician subsequent to the intervention triggered the mid-point interview of the parent. Patients making visits were identified from physician office records. Visits were tracked over a 22-month period, and on average interviews were conducted within 2 months of the visit. A total of 472 enrolled parents of patients were interviewed at mid-point, that is, the child made a visit and the parent could be reached in the 22-month window. Data describing the results of the mid-point evaluation are provided elsewhere [11].

The long-term evaluation, the focus of this paper, used the same survey and interview methods and was conducted 1 yr after the mid-point. At the time of the final evaluation, 67 physicians (34 experimental group, 33 control) and 369 patients (202 experimental group, 167 control group) provided data, both samples being well within the range of initial sample size calculations (physicians=44, patients=220). The authors investigated reasons for drop out. Over half of the attrition (68%) was attributable to disconnected telephones and families moving away. Approximately 22% of drop-outs claimed children were no longer having asthma symptoms. About 10% reported other reasons such as dislike of research studies. There were no differences in experimental and control group drop-out on demographic variables: age, income and education. There were differences in drop-out related to healthcare utilization. Children who had more hospital stays and ED visits were more likely to be in the experimental group than in the control group. Therefore, the assessment of the intervention judged by using the final data set is likely to provide a conservative estimate of effect. Only final evaluation data are presented here. The authors were interested in significant effects comparing the baseline and final evaluation time points rather than changes from baseline to mid-point and mid-point to final. At mid-point, some effects were apparent that were not observed in the final evaluation. Conversely, some final outcomes did not reach significance by mid-point. This paper focuses on results evident in data collected on average 2 yrs postprogramme. This time frame allows identification of behaviours of clinicians that are likely to have become routine, and affords sufficient time for changes in patients′ use of health services to emerge.

Measures

The physician survey comprised items related to clinical practice including the use of particular medicines (*e.g.* bronchodilators, anti-inflammatory drugs), procedures for encouraging self-management by patients, and aspects of patient teaching and communication behaviour. A potential source of bias in the study was that physicians would give positive reports of their behaviour to be consistent with good clinical and communication practice. To guard against such bias, data were collected from parents of patients about physician behaviour as a means of corroborating physician reports. Analysis of data showed a close correlation between physician and parent descriptions of behaviour [10]. Questions on the parent interview form related to the symptom status of the child, the medicines prescribed, the use of healthcare services for asthma in the previous 12 months (ED visits, hospitalizations, physician office visits). The parents′ observations and opinions of the physicians′ teaching and communication behaviour, and other aspects of the clinician-patient interaction comprised items assessed by use of a five-point Likert scale [12].

Data analyses

Analyses reported here were focused on assessing outcomes related to the three study hypothesis using three categories of variables: 1) physician behaviour changes in teaching and communication skills (ten variables), behaviour when prescribing new medicine (five variables), therapeutic steps (six variables), and time spent with patient (one variable); 2) the parent′s view of the paediatrician′s performance (20 variables); and 3) the patient′s use of healthcare for asthma (four variables). Other outcomes regarding disease severity, quality of life, and medication use will be discussed in later papers.

For physician behaviour items from the survey, Chi-squared tests for categorized variables, unpaired t-tests for continuous variables, and analysis of variance were conducted. Logistic regression controlling for baseline data was used for physician behaviour variables coded or recorded as dichotomous outcomes. The p-values from Chi-squared, odds ratio (OR), and 95% confidence intervals were examined to assess statistical and substantial differences between treatment and control groups.

For patients′ views of physician behaviour, cumulative logistic regression (CLR) models with proportional ORs were utilized. For children′s healthcare use Poisson regression models (PR) were employed with an offset variable to account for different length of time on which Poisson outcomes were counted. For both the CLR and Poisson regression models generalized estimating equations (GEE) techniques were used to assess changes from baseline to final evaluation and to determine whether these changes differed significantly between patients whose physicians participated in the education and patients who physicians served as controls. CLR and PR were used due to the discrete nature of the outcome variables. The GEE method accounted both for clustering of patients that may occur as a result of several being treated by the same physician and for unbalanced data due to drop-out over time [11]. To assess healthcare use, both main and interaction effects in several models were examined to determine the relative importance of demographic variables, levels of baseline healthcare use, and whether or not the patient had been prescribed anti-inflammatory medicine. The aim was to ascertain whether receiving this medicine rather than being educated by a more skilled physician might account for any observations of reductions in healthcare. For each

form of health service (ED use, hospitalizations, regularly scheduled office visits, and visits to follow-up an episode of symptoms), nonsignificant variables were excluded and the most explanatory model was selected [13]. In all final models, demographic factors (*e.g.* income, age, and education) were not significant and were deleted.

Results

Description of the samples

The majority of paediatricians were male (60%). The age distribution of the clinician sample was as follows: 30–39 (22%); 40–49 (37%); 50–59 (27%); and ≥60 (14%). Study physicians were divided between solo (57%) and group practice (37%), with an additional 6% in multi-specialty practices. In their practices, 54% of the physicians spoke English only, two physicians (3%) Spanish only, and the rest spoke both English and another language (43%). A high proportion of solo practitioners and bilingual physicians were located in the New York City area, thus, the higher than national average on these factors may be related to particular aspects of medical practice in New York City.

Parent/patient characteristics were as follows: 70% of the patients were males, 7% were aged <2 yrs, 59% aged 2–7 yrs, and 34% were 8–12 yrs of age at baseline. Sixty per cent of the parents were 30–39 yrs old, 75% were married, and ~90% had a high school education or above. Approximately 20% of the families had ≤$20,000 annual income, 16% were at or below the poverty level (≤$15,000 a year), and 17% were on some form of government assistance for healthcare during the period of baseline data collection. Thirty per cent of families were nonwhite (Latino/Hispanic: 15%; African American: 15%).

Physician behaviour

Table 2 presents findings from the physician survey final data using Chi-squared and logistic models. Communication and patient education strategies taught in the intervention were used more extensively by treatment group physicians. At end-point, more physicians in the education group, compared to controls, wrote down for patients how to adjust the dose or timing of medicines at home when a child's symptoms changed (OR 3.3, p= 0.02) and provided specific guidelines for patients to use in order to change therapy when clinical conditions change (*e.g.* anticipated exposure to a trigger; OR 2.4, p= 0.02). Writing down these instructions for patients is a primary clinician action in helping patients to effectively manage at home. Also, significantly more physicians participating in the education used a protocol for determining from one visit to the next what they had communicated to the family regarding asthma management (OR 1.9, p= 0.01).

There were no significant differences between programme and control groups in the amount of time physicians reported spending with their asthma patients (programme 25.9 min *versus* control 29.0 min). Nor were there differences between the groups in the proportion of patients for whom physicians' prescribed anti-inflammatory medicine (87.5% *versus* 77.3%).

Parents' view of physician behaviour

Table 3 presents data regarding parents' views of study physicians' demeanour and communication skills during the most recent office visit. Main effects for programme participation illustrated that parents of patients whose physician had participated in the seminar were more likely to say that the doctor had communicated and educated effectively in the most recent visit. Compared to controls these parents were significantly more likely to report that the physician paid close attention to the family (estimate 1.49, p=0.03); commended parents for taking the right management actions (estimate 1.32, p=0.02); created an exchange of information by asking open-ended questions (estimate 2.29, p=0.03); inquired about the patients' specific fears and concerns associated with using new medicines (estimate 3.92, p=0.02); explained the short-term therapeutic plan, that is, what the family should do between the current visit and the next one (estimate 1.49, p=0.03); and made it easy for families to follow medication instructions (estimate 1.19, p=0.00). More of these parents also reported that the physician spent enough time with them although this finding fell just short of statistical significance. The typical model used to calculate the cumulative logistic regression in table 3 is: probability of getting more positive score at final evaluation=intercept k (k=1,2,3,4 (reference: k=5)) + $\beta 1 \times$ PP + $\beta 2 \times$ baseline score; +$\beta 3 \times$ interaction of PP and baseline score, where K is the term for the scale (1–5), $\beta 1$–$\beta 5$ are estimates of the corresponding predictors in the regression models;

Table 2. – Postprogramme differences in physicians' behaviour

Variable	Chi-squared table				Multiple logistic regression*	
	Per cent		p-value	Odds ratio	p-value	Odds ratio
	Programme n=34	Control n=33				
Write down for patient how to adjust medicines when symptoms change***						
	29 (n=10)	6 (n=2)	0.02	3.3	0.05	5.7
Provide guidelines for patient on how to adjust therapy when clinical conditions change***						
	38 (n=13)	13 (n=4)	0.02	2.4	0.06	3.8
Use protocol to keep track of elements of education provided to families**						
	82 (n=28)	53 (n=18)	0.01	1.9	0.02	4.9

*: multiple logistic regression controlling corresponding baseline data; **: dichotomous variables 1=very often, occasionally, 0=rarely, never; ***: dichotomous variables 1=always, 0=less than always.

Table 3. – Effects (main and interaction) of programme participation (PP) on parents′ view of physician behaviour*

Outcome variable	Baseline score predicting outcome#		PP		Interaction term predicting outcome‡		Adjusted mean at follow-up	
	Estimate	p-value	Estimate	p-value	Estimate	p-value	Programme	Control
Physician paid close attention to family	0.796	0.018	1.494	0.037	0.792	0.090	4.54	4.41
Physician let me know when I did things right	0.880	0.000	1.327	0.022	0.517	0.050	4.26	4.16
Physician asked open-ended questions	0.650	0.005	2.290	0.031	1.294	0.007	4.38	4.28
Physician asked me about specific fears/ concerns with medicine	0.375	0.358	3.926	0.018	1.001	0.050	3.45	2.88
Physician gives me a good idea of the short-term treatment plan	0.495	0.064	1.496	0.032	0.683	0.080	4.41	4.27
Physician makes it easy for us to follow instructions for medications	0.512	0.119	2.300	0.004	1.201	0.007	4.50	4.35
Physician spends enough time with us	1.054	0.000	1.193	0.067	0.680	0.041	4.33	4.30

*: cumulative logistic regression with generalized estimating equations controlling for baseline data, including interaction between baseline and PP. #: there were no significant differences between treatment and control group for any of these at baseline; however, all analyses controlled for these corresponding (by items) baseline scores, because the behaviour at baseline predicted the behaviour at final follow-up for four items, and baseline score interacted with PP group for five items; +: the programme had a positive effect ($p<0.04$) on each outcome variable except "time spent with patients" where the effect was marginal ($p<0.07$); ‡: interactions of baseline score and PP were negative and significant ($p<0.05$) for five items, indicating that the effect of the programme was greater for those participating physicians whose score at baseline was higher.

and PP is programme participation. The adjusted means in table 3 were calculated using the formula: adjusted mean (m) = sum (probability$_k$ × score$_k$; k=1–5 (strongly agree=5, strongly disagree=1)), $P_k=P(y\leq k) = e^m/e^m+1$; m = intercept + β1 × group + β2×mean of baseline score + β3 × mean of baseline score×group; hence probability$_k$ = P_k-P_{k-1}, where P is probability and y is the term for the responses.

Patients′ healthcare use

Table 4 presents the model with main effects for primary predictors related to children′s postprogramme hosptalizations. The typical model is as follows: log (mean of healthcare use) = intercept + β1 × baseline score + β2 × programme participation + β3 inhaled anti-inflammatory medicine use at baseline + β4 × inhaled anti-inflammatory medicine use at follow-up (+ interaction of baseline healthcare use × physicians′ participation in seminar). The adjusted means in table 4 were calculated using the following formulae: adjusted means = e^m; m = intercept + β1 × mean of baseline score + β2 × group + use at baseline + β4 × medicine use at final follow-up (+ β5 × interaction). Three factors were important. Children whose physicians participated in the seminar were significantly more likely to have fewer hospitalizations at end-point (estimate -1.29, p=0.03) than control group children. Children with higher levels of baseline hospitalization in both groups were more likely to have more postprogramme hospitalizations, although the finding did not reach statistical significance. Being on inhaled anti-inflammatory medicine at baseline was not a significant predictor of subsequent hospitalizations for either programme or control group children. However, being currently on inhaled anti-inflammatory medicine, that is, at the time of final data collection, was associated with a greater number of hospitalizations in both groups (estimate 1.19, p=0.04).

Table 4 also presents data on main and interaction effects on children′s postprogramme ED use. Again, three factors were significant. Having the physician participate in the seminar (programme group) by itself did not result in a reduction in ED use by the final evaluation point. However, the interaction of being in the programme group and having a higher level of baseline ED use did predict subsequent reductions in ED use (estimate -0.13, p=0.03). Being seen by a physician who took part in the education resulted in less ED use for children who used the ED more often at baseline. In both the programme and control groups, children with greater baseline ED use had more at end-point use (estimate 0.19, p=0.00). Using inhaled anti-inflammatory medicine at baseline did not significantly predict subsequent ED use in either group, although findings were in the direction of fewer ED visits. Current use of inhaled anti-inflammatory medicine was significantly associated with more ED use for both programme and control group children at end-point (estimate 0.67, p=0.05).

The story for physician office visits was different. Table 4 shows postprogramme data on regularly scheduled office visits for asthma. There was no significant main effect for physicians′ participation in the seminar on these visits although findings were in the direction of less use. Regardless of group (programme or control), children who had more regular scheduled visits at baseline also had more at end-point (estimate 0.06, p=0.00). Using inhaled anti-inflammatory medicine at baseline predicted fewer postprogramme regularly scheduled office visits in both groups although the finding fell short of statistical significance. Current use of inhaled anti-inflammatory medicine was not a significant predictor of regular scheduled office visits in either group, although the direction of the findings was consistent with hospitalizations and ED use, that is, a greater number of regularly scheduled visits indicated more current medicine use.

Table 4. – Effects of programme participation (PP) on children's healthcare (HC) use*

Outcome variable	Baseline value predicting outcome#		PP predicting outcome+		Interaction term participation and baseline value predicting outcome‡		Baseline inhaled anti-inflammatory use predicting outcome**		Current inhaled anti-inflammatory use predicting outcome##		Adjusted means	
	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value	P	C
Hospital admission	0.45	0.62	-1.3	0.03			-0.02	0.97	1.2	0.04	0.03	0.10
ED visits	0.19	0.00	-0.26	0.44	-0.13	0.03	-0.90	0.82	0.67	0.05	0.29	0.47
Scheduled visits	0.06	0.00	-0.21	0.43			-0.56	0.06	0.32	0.24	1.3	1.6
Follow-up visits	0.11	0.00	-0.27	0.36			-0.75	0.03	0.76	0.01	0.59	0.71

*: Poisson regression with generalized estimating equations controlling for baseline value and current and baseline inhaled anti-inflammatory medicine including interaction between baseline value and PP. #: there were no significant differences between treatment and control group on these items at baseline, however, all analyses controlled for baseline. The more the HC use at baseline, the more the HC use at final follow-up for three items ($p<0.05$); +: PP had significant effect on hospitalization ($p<0.05$); ‡: four models including various predictors were tested for each outcome variable. The model with the least number of predictors and the most number of significant predictors was selected as the best model reported in this table. Except for emergency department (ED) visits, the best model for HC use outcome did not include interaction terms. There was a significant interaction effect between baseline value and participation for ED use. Patients who had three or more ED visits at baseline and whose physician participated in the seminar had fewer ED visits than controls at final follow-up; **: baseline use of inhaled anti-inflammatory medicine had no significant effect on HC use for either programme or control group except for visits to follow-up an asthma episode. Greater use of anti-inflammatory medicine at baseline predicted fewer follow-up visits at final evaluation ($p<0.05$); ##: excluding scheduled visits, current use of inhaled inflammatory medicine was significantly correlated with more HC use by both programme and control at final evaluation ($p<0.04$), hospitalization ($p<0.05$), ED visit, and follow-up visits ($p<0.01$). P: programme; C: control.

Table 4 illustrates a similar pattern of interaction effects regarding unscheduled postprogramme office visits to follow-up an episode of asthma symptoms. Physician participation in the seminar did not affect these visits. For both programme and control children, a greater number of baseline visits of this kind significantly predicted a greater number of the same type of visits at end-point. Use of baseline inhaled anti-inflammatory medicine in both groups significantly predicted fewer postprogramme office visits to follow-up an episode of asthma symptoms (estimate -0.74, p=0.01). On the contrary, current use of inhaled anti-inflammatory medicines was a significant predictor in both groups of more office visits of this type at end-point (estimate 0.75, p=0.01).

Discussion

To the authors' knowledge this is the first study to assess the long-term effects of an education programme for physicians on their behaviour and the healthcare use of their asthma patients subsequent to the intervention. Participating physicians reported effects in areas of instrumental support to their patients [10]. Their actions took the form of giving specific guidelines and instructions to patients on how to adjust the therapeutic regimen when symptoms or clinical conditions changed, and tracking which elements of education had been provided to the families visit to visit. In the seminar, participants were shown how to provide instructions to patients through use of a specially designed form. By completing the form, the physician gave the patient, in writing, the trajectory of anticipated medicine use over time in a clear way that also provided cues for patient action [14]. Furthermore, programme physicians reported using a checklist, also provided as part of the intervention, to keep track of their educational communications. It was designed to be easy to complete and to be kept in the patient's file. Samples of the priority asthma educational messages to deliver to patients were also provided at the seminar.

Participating physicians reported that they communicated and taught patients in this more sophisticated way using no more time per visit than physicians in the control group. These findings contradict an often voiced belief that a visit including effective patient education is more time consuming that a visit without such education.

Parents of children with asthma whose physicians took part in the seminar corroborated physician reports indicating that programme group doctors used a range of communication and education strategies that have been shown to enhance patient learning and satisfaction. Communication training, including a video demonstration of 10 specific techniques (table 1), was a central feature of the seminar.

There were changes in the healthcare use of the children whose physicians received training that included communication and patient education skills taught at the seminar. At the time of final data collection, compared to controls, they were less frequently hospitalized for asthma and those who had higher levels of baseline ED use lowered their use.

Looking at physician office visits sheds more light on the patterns of healthcare use. Physicians' participation in the seminar did not affect the number of postprogramme office visits made by their patients. Both types of visits that were tracked (regularly scheduled and visits to follow-up an episode of asthma symptoms) were higher for both programme and control children who had higher levels of baseline visits of this type.

The effects attributable to the intervention appear not to be primarily a function of prescribing anti-inflammatory medicine or spending more time educating patients. No differences between control and programme physicians were noted on these aspects of care. Rather, it is likely that

improved communication and patient education on the part of the physician, and more effective use of the time available for the visit, accounted for the outcomes. Nonetheless, it may be that patients of physicians attending the seminar generally used medicines more effectively. APTER *et al*. [15] have illustrated that poor adherence to a medical regimen is related to poor patient-clinician communication.

It is not possible from these data to determine when new physician behaviour emerged. It is likely that the type of behaviour seen (use of checklists, patient guidelines) can become routine fairly easily, and, indeed, some of these behaviours were noted at mid-point and have been noted by others [11, 16]. Similarly, such behaviour can stimulate communication between physician and patient and over time more effective communication will probably lead to changes in patient behaviour and greater patient satisfaction with physician care. The current authors noted that the correlation between improved clinician communication (as rated by the patient) and greater satisfaction with care received was very high (Spearman correlation coefficient 0.65, p=0.00001). The combination of knowing the specific communication means to use and recognizing greater patient appreciation may motivate physicians to make such behaviour a "habit". Healthcare use, as noted in other studies [17], is difficult to assess without adequate evaluation time. For these asthma patients a time period, on average, of 2 yrs duration appears to have been sufficient to note change related to hospitalization and ED use.

An even stronger means of assessing the effects of interventions such as the one presented here, may be clinical end-points. These outcomes might include symptom severity, quality of life, and days of missed school. The authors are exploring these variables for future reports.

The results of this study indicate that a seminar for paediatricians that combined training on how to: improve prescribing practices; use effective communication strategies with patients; and teach patients using specific asthma messages, had a significant long-term effect on physician behaviour, children′s healthcare use and parents′ views of clinician performance.

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