Integrated care for asthma: a clinical, social, and economic evaluation

Grampian Asthma Study of Integrated Care (GRASSIC)

Abstract

***Objectives*—To evaluate integrated care for asthma in clinical, social, and economic terms.**

***Design*—Pragmatic randomised trial.**

***Setting*—Hospital outpatient clinics and general practices throughout the north east of Scotland.**

***Patients*—712 adults attending hospital outpatient clinics with a diagnosis of asthma confirmed by a chest physician and pulmonary function reversibility of at least 20%.**

***Main outcome measures*—Use of bronchodilators and inhaled and oral steroids; number of general practice consultations and hospital admissions for asthma; sleep disturbance and other restrictions on normal activity; pyschological aspects of health including perceived asthma control; patient satisfaction; and financial costs.**

***Results*—After one year there were no significant overall differences between those patients receiving integrated asthma care and those receiving conventional outpatient care for any clinical or psychosocial outcome. For pulmonary function, forced expiratory volume was 76% of predicted for integrated care patients and 75% for conventional outpatients (95% confidence interval for difference -3·6% to 5·0%). Patients who had experienced integrated care were more likely to select it as their preferred course of future management (75% (251/333) *v* 62% (207/333) (6% to 20%)); they saved £39.52 a year. This was largely because patients in conventional outpatient care consulted their general practitioner as many times as those in integrated care, who were not also visiting hospital.**

***Conclusion*—Integrated care for moderately severe asthma patients is clinically as effective as conventional outpatient care, cost effective, and an attractive management option for patients, general practitioners, and hospital consultants.**

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Introduction

Asthma is an important chronic health problem, affecting patients of all ages. The prevalence of the disease is increasing,[1-3] as are admission rates for adults with asthma.[4,5] In contrast with other chronic diseases, mortality for asthma has been rising in the United Kingdom[6] and in North America.[7,8]

Most patients with mild and moderate symptoms of asthma receive most, if not all, of their asthma care in general practice, but some patients with asthma are referred to specialist chest clinics, either directly by their general practitioner or after an acute episode requiring hospital admission. The British Thoracic Association suggested that up to 86% of asthma deaths are preventable and recommended "closer overall supervision" as one means of improving medical care.[9] Guidelines for the management of asthma in adults have advocated "regular liaison" between hospital and community services in the management of patients.[10]

Developments in information technology, increasing awareness among general practitioners about the management of asthma patients,[11-13] and changes in the relation between primary care and hospital as a result of general practice fundholding are creating opportunities for novel management strategies for chronic diseases such as asthma. Foremost among these is the development of integrated or shared care schemes, in which general practitioners share both clinical responsibility and information with specialist chest physicians.

The Grampian asthma study of integrated care (known as GRASSIC after the Aberdeenshire novelist Lewis Grassic Gibbon) was designed to evaluate, in clinical, social, and economic terms, the effectiveness of integrated care, self monitoring of peak flow, and personalised, computer based education for asthma patients. This paper reports on our evaluation of integrated care. The evaluations of peak flow self monitoring and enhanced education are reported separately.[14,15]

Method

INTEGRATED CARE AND CONVENTIONAL OUTPATIENT CARE

In 1989 an integrated care scheme was implemented for patients with asthma regularly attending outpatient chest clinics in Aberdeen, Banff, Elgin, and Peterhead. Using the computer based patient record system,[16] chest physicians review patients in this scheme annually. Interim reviews take place in general practice, typically every three months; however, the interval between reviews can be shortened if the patient's condition merits this. Patients are sent computer generated questionnaires at the appropriate time, inviting them to make an appointment with their general practitioner, and asking for information about symptoms, days of restricted activity, nights of disturbed sleep, courses of oral steroids, general practice consultations, and admissions for asthma. Patients are asked to give the completed questionnaire (together with a peak flow diary card if appropriate) to their general practitioner at the consultation.

Simultaneously, the patient's general practitioner is sent a separate computer generated questionnaire, mentioning that the patient is due to attend shortly for an asthma review and enclosing a questionnaire about consultations, pulmonary function, β agonist bronchodilators and steroid courses prescribed, changes to the patient's medication, and hospital admissions. The general practitioner is asked to return all documentation to the consultant. The information from both questionnaires is then added to the patient's computerised record. Copies of the updated record are sent to the general practitioner, along with any suggestions

from the consultant for changes in the management plan.

Patients receiving conventional outpatient care are seen at their regular outpatient clinic, typically every three months. During the study year, they too were sent a clinical questionnaire before each visit, to be returned to the specialist. Additional clinic attendances were arranged by the consultant or general practitioner if necesary.

EVALUATION OF INTEGRATED CARE

The Grampian asthma study of integrated care was constructed as a 2×2×2 randomised trial[17]: patients were independently assigned (through block randomisation stratified by entering physician) between integrated and conventional outpatient care; between peak flow self monitoring and conventional monitoring; and between enhanced education and conventional education. Thus each patient could have been randomised to receive all three innovations, or any two, or any one, or none at all. Patients whose asthma was considered too difficult for integrated care were excluded from randomisation for that dimension of the study but were considered for randomisation along the two remaining dimensions. Similarly, patients who already owned a peak flow meter were excluded from randomisation for that dimension of the study but were considered for randomisation on the two remaining dimensions.

The 2×2×2 design was preferred to three separate trials since it has two major advantages. Firstly, it greatly reduced the total number of patients needed to achieve the specified statistical power of detecting differences between each pair of policies. Secondly, using such a design gives the opportunity of studying and testing for interaction between the three innovations and seeing whether the effect of one innovation depends on changes in the other two innovations. In summary, this design yields three separate trials (and more) for the price of one.

PATIENTS AND ASSESSMENT

To be eligible for the study patients had to be aged 16 years or over, have a diagnosis of asthma confirmed by a chest physician, and have shown pulmonary function reversibility of at least 20% on treatment. Patients were entered as they attended outpatient clinics for review between October 1989 and December 1990. A flow chart was attached to the notes of each eligible patient, guiding the physician to one of four sealed, opaque, numbered envelopes. Inside the envelope, a sheet of paper specified the precise combination of policies to which the patient was to be assigned. Close supervision of randomisation was maintained throughout the period of patient entry. Each patient participated in the study for one year.

Patients were interviewed twice: at entry to the study and just before their consultation with a consultant one year later. The initial interviews included a self efficacy scale based on that developed by Tobin[18]; the anxiety component of the hospital anxiety and depression scale[19]; a scale derived from the living with asthma scale[20] to measure social and physical functioning; and a question on their perceived level of asthma control. The final home interviews provided the main social, psychological, and self management information. All measures applied in the first interview were repeated and augmented, notably by questions about depression[19] and perceptions of health care.

The hospital anxiety and depression scale assesses anxiety and depression as independent dimensions; it measures severity of psychological dysfunction as well as differentiating between "cases" and "non-cases." Self efficacy is a concept that links health behaviour with an individual's confidence in his or her ability to change that behaviour; the self efficacy scale asks patients how confident they are that they could control their asthma in a variety of contexts (for example, "when I'm angry" and "when there is pollen in the air"). The living with asthma scale concentrates on the effects of asthma on social and physical functioning; respondents are asked to describe how true certain statements were for them (for example, "I can take part in any sport I want" and "Having asthma means I sometimes have to go home after a night out sooner than other people").

Five clinical outcome measurements and two symptom measurements were used to evaluate the clinical effectiveness of integrated care. The clinical measurements consisted of the numbers of prescriptions for bronchodilators and inhaled steroids, the use of oral steroids, general practice consultations for troublesome asthma, and hospital admissions. The symptom outcomes, calculated by averaging the relevant data provided by the patient over all the available three monthly review questionnaires, comprised the average number of days of restricted activity in a month because of asthma, and the average number of disturbed nights over the course of a week.

Information about costs to patients was obtained by an extra postal questionnaire sent immediately after their third quarterly review. Costs to general practitioners were derived from existing information.[21,22] Health service costs were derived in collaboration with Grampian Health Board.

Data were analysed on the basis of intention to treat: patients who did not adhere to the management plan to which they had been assigned were still assumed to have done so for the purposes of analysis. Failure to adhere and failure to respond therapeutically were both regarded as failures of treatment.[23,24] In other words the trial was based on normal clinical practice, so as to guide practical decisions rather than merely to acquire scientific information. Thus it was "pragmatic" rather than "explanatory."[23]

Both the Grampian Joint Ethical Committee and the general practitioner subcommittee of Grampian Area Medical Committee had previously approved the study. Each of the 330 general practitioners in Grampian was contacted by letter and given an outline of the project and an opportunity not to take part. Only one preferred not to take part, and his patients were duly excluded from the study.

STATISTICAL ANALYSIS

Integrated care vs conventional care

For outcome measurements that count events, such as bronchodilator prescriptions, general linear modelling through the GLIM package age[25] was used to test for a significant effect of integrated care on patient outcomes after correcting for initial peak flow, forced expiratory volume in one second (as a percentage of that predicted), and duration of asthma. We adopted a Poisson error structure and a log link function and included a scale factor when necessary to overcome the problem of overdispersion.[26]

Examination of the two outcomes of symptoms showed that some patients did not report restricted activity or disturbed nights. There was no association between membership of this group of patients and randomisation to integrated or conventional care. Hence only those patients who varied in their number of disturbed nights or of restricted days were analysed by GLIM with a Normal error structure and a log link function.[25,26]

For the outcomes of pulmonary function and the anxiety, self efficacy, and living with asthma scales we adopted a Normal error structure and an identity link function. Since the depression data are skewed among our patients, we adopted a Normal error structure and

a log link function. For those outcome measurements with a binary response we adopted a binomial error structure and a logit link function. The appropriateness of all these models was confirmed by the relevant goodness of fit test.[26]

Data processing and analysis were conducted with Scientific Information Retrieval[27] and SPSS[28] software on the mainframe computer of Aberdeen University. Our basic sample size of 800 provides 80% power of detecting at the 5% significance level a difference (between each pair of policies on each of the three dimensions) equivalent to 20% of the standard deviation of the variable in question.

Interaction between the three innovations

Generalised linear modelling through the GLIM package[25] was first used to test for interaction between the two subgroups of the sample who were ineligible for randomisation and the remaining two innovations singly and in combination, after correction for initial peak flow, forced expiratory volume in one second (as a percentage of that predicted), and duration of asthma. The same technique was then applied to test for interaction between all combinations of the three innovations. The same statistical models were used as when testing for differences between integrated and conventional care.

TABLE I—*Allocation of patients*

	Randomised		Allocated to conventional care*	Total
	Integrated care	Conventional care		
Randomised to peak flow meter:				
Enhanced education	67	63	7	137
No education	71	67	10	148
Randomised to no peak flow meter:				
Enhanced education	67	65	11	143
No education	66	67	8	141
Already possessing peak flow meter:				
Enhanced	47	46	24	117
No education	45	41	29	115
Total	363	349	89	801

*Asthma was too severe for randomisation.

TABLE II—*Pulmonary function after 12 months*

Pulmonary outcome	Integrated care (n≥315)	Conventional care (n≥315)	Difference in means (95% confidence interval)
Mean (SD) forced expiratory volume in one second (% of predicted)	76·0 (28·0)	75·2 (27·2)	0·8 (−3·6 to 5·0)
Mean (SD) peak expiratory flow rate (l/min)	351 (120)	351 (123)	0 (−19 to 19)

TABLE III—*Clinical outcomes over 12 months. Values are means (95% confidence intervals)*

Clinical outcome	Integrated care (n≥296)	Conventional care (n≥277)	Ratio of means
No of bronchodilators prescribed	10·1 (9·2 to 11·1)	10·6 (9·7 to 11·7)	0·95 (0·83 to 1·09)
No of inhaled steroids prescribed	6·4 (5·9 to 6·9)	6·5 (6·1 to 7·1)	0·98 (0·88 to 1·09)
No of courses of oral steroids used	1·6 (1·4 to 1·8)	1·6 (1·4 to 1·9)	0·97 (0·79 to 1·20)
No of general practice asthma consultations	2·7 (2·4 to 3·1)	2·5 (2·2 to 2·8)	1·11 (0·95 to 1·31)
No of hospital admissions for asthma	0·15 (0·11 to 0·19)	0·11 (0·08 to 0·15)	1·31 (0·87 to 1·96)

Means and 95% confidence interval are estimated from Poisson regression models after controlling for initial peak flow, forced expiratory volume (as % of predicted), and duration of asthma.

TABLE IV—*Symptoms after 12 months for patients who showed variations in symptoms. Values are means (95% confidence intervals)*

Outcome	Integrated care (n≥76)	Conventional care (n≥81)	Ratio of means
No of nights disturbed/week	2·4 (2·1 to 2·8)	2·4 (2·1 to 2·7)	1·01 (0·85 to 1·21)
No of days of restricted activity/month	5·7 (4·3 to 7·6)	4·8 (3·5 to 6·7)	1·20 (0·78 to 1·84)

Means and 95% confidence intervals are estimated from Normal regression models after controlling for initial peak flow, forced expiratory volume (as % of predicted), and duration of asthma.

TABLE V—*Psychological outcomes at final interview. Values are means (95% confidence intervals) unless stated otherwise*

Psychological outcome	Integrated care (≥339)	Conventional care (≥331)	Difference (95% confidence interval)
Anxiety	6·5 (6·1 to 7·0)	6·5 (6·1 to 7·0)	0 (−0·56 to 0·63)
Self efficacy scale	2·0 (1·9 to 2·1)	2·0 (1·9 to 2·1)	0 (−0·05 to 0·09)
Living with asthma scale	2·9 (2·8 to 3·0)	2·9 (2·8 to 3·0)	0 (−0·10 to 0·11)
Depression*	3·6 (3·4 to 4·0)	3·6 (3·3 to 3·9)	1 (0·89 to 1·11)
No (%) controlling asthma "all the time"	231 (68)	197 (60)	8 (1 to 16)†

*Geometric means; 95% confidence interval for ratio of means.
†$P<0·05$.

Results

Thirty seven patients declined to take part in the study; they were assigned to conventional management, monitoring, and education and were excluded from data collection. A total of 801 patients gave informed consent and were randomised to the three innovations (table I). Eighty nine patients were considered by the chest physicians to be ineligible for randomisation between integrated care and conventional outpatient care; they continued with quarterly outpatient reviews. The reason given for their ineligibility was usually "severity of asthma." The remaining 712 subjects were eligible for randomisation; 363 were allocated to integrated care and 349 to conventional outpatient care (thus providing 80% power of detecting at the 5% significance level a difference between integrated and conventional care equivalent to 21% of the standard deviation of the variable in question).

After 12 months, pulmonary function was not significantly different in the two groups (table II). The effect of integrated care on the five clinical measurements, after adjustment for the patient's initial peak flow, forced expiratory volume in one second (as a percentage of predicted), and duration of asthma, is summarised in table III. For the number of prescriptions for bronchodilators and inhaled steroids, the number of oral steroid courses used, and the total number of general practice consultations and hospital admissions during the year, the analysis showed no significant differences between the integrated care and conventional care groups.

During the study year, 46% of patients (278/605) reported no sleep disturbance (47% (142/300) in the integrated care group and 45% (136/305) in the conventional care group) and 6% (36/605) in both the integrated (19/300) and conventional (17/305) care groups reported that their sleep was disturbed every night. Analysis confirmed that type of care was not significantly associated with this distribution of sleep disturbance. For those patients who sometimes reported sleep disturbance, the mean number of disturbed nights in a week is shown in table IV; no significant differences were found between the two groups. Similarly, 73% of patients (415/572) reported no restriction of activity because of asthma (73% (205/281) in the integrated care group and 72% (210/291) in the conventional care group). Among those patients who reported some restriction of activity, no significant differences were found between the two groups.

In all, 675 (95%) of the patients eligible for randomisation between integrated and conventional care were interviewed in their homes. The remaining 37 were either not at home on three separate occasions, or declined to be interviewed; they were equally distributed between integrated and conventional care. There were no statistically significant differences between integrated care and conventional care patients in anxiety, depression, self efficacy, or social and physical functioning (table V). When asked to rate their perceived level of asthma control, integrated care patients were significantly more likely to describe themselves as being in control "all the time."

For both anxiety and depression dimensions of the

HAD scale, scores of eight to 10 indicate doubtful "cases" of clinical psychopathology, and scores of 11 or over indicate definite cases; in this study the mean anxiety and depression scores for both integrated and conventional care patients were all within the normal range. Scores for each item of the self efficacy scale range from 0 (no confidence) to 3 (very confident); both integrated and conventional care patients recorded mean scores towards the higher end of the range. Responses to each item of the living with asthma scale range from 1 (untrue) to 4 (very true); after the responses were recalibrated so that higher scores indicated least restriction on activity, mean scores for integrated and conventional care patients were both towards the higher end of the range.

At the final interview, those patients who had been randomised to receive conventional outpatient care were reminded of the nature of integrated care and asked for their opinions of it. Their comments were compared with the opinions expressed by those patients who had received integrated care (table VI). Those who had experienced integrated care were more likely than conventional care patients to cite positive attributes of their general practitioner (such as having confidence in him or her) as an advantage. Conventional outpatients were more likely to perceive both advantages and disadvantages of integrated care. They were also less likely to accept the opportunity of integrated care were it to be offered. These results suggest that there is a "credibility gap" to be overcome in order to establish patients' confidence in integrated care. This view is reinforced by the fact that integrated care patients were significantly less likely to describe themselves as "very satisfied" with the medical care they had received for asthma during the course of the year (77%; 263) than conventional care patients (86%; 284). At the end of the project, general practitioners preferred integrated care for the future management of 64% of all patients in the study (512 patients).

INTERACTION BETWEEN TYPE OF CARE, PEAK FLOW SELF MONITORING, AND EDUCATION

Tests for interaction gave few statistically significant results. Table VII summarises the significant interactions between type of care received and peak flow ownership at the beginning of the study.

After 12 months in the study, patients who did not possess a peak flow meter at the beginning of the study showed a significantly higher mean number of hospital admissions if they were under integrated care than did those in conventional care (ratio of means 1·76; 95% confidence interval 1·09 to 2·85). Patients who already owned a peak flow meter at the beginning of the study were more likely to report no disturbed nights if receiving integrated care (odds ratio 1·92; 1·02 to 3·64). Significant interaction between the type of care received and the combination of the other two innovations is reported separately.[14 15]

COSTS

During the study year, conventional care patients attended hospital an average of 2·6 occasions more than integrated care patients. The costs of operating an integrated care scheme for asthma were calculated. All relevant staffing and material costs were included, taking account of both the savings attributable to the changes in the number of hospital and general practice consultations, as well as the costs of administering integrated care. The Grampian integrated care for asthma scheme was calculated at 1991 prices to save the hospital an average of £3.06 per patient per year; to save general practitioners (assuming they were fundholders) £2.41 per patient per year, and to save the patients themselves £39.52 per year.[29]

Discussion

Despite a history extending back over 20 years,[30 31] formal schemes integrating the roles of specialist and general practitioner in the management of chronically ill patients are still rare. Most of the existing schemes are for the care of diabetes,[32-34] and most previous attempts to conduct rigorous evaluative research have been restricted to that condition.[35 36] Both these studies reported adverse effects on patients in terms of poor supervision and worse control of diabetes. A recent pragmatic study of shared care for hypertension in Glasgow concluded that shared care was cost effective but presented no data on patient outcomes.[37]

The development of shared care, therefore, has been hindered by lack of empirical evidence about its clinical and cost effectiveness. The Grampian asthma study of integrated care provides such evidence for asthma. Overall, integrated care patients were at no clinical, psychological, or social disadvantage through membership of such a scheme. They benefited financially and in their perceived level of asthma control. Three quarters wanted to continue within the scheme.

All patients in the study had originally been referred to hospital by their general practitioner for help in the diagnosis or management of their asthma, and there-

TABLE VI—*Patients' perceptions of integrated care for asthma at final interview*

Patients' perceptions	Integrated care (n ≥ 333)	Conventional care (n ≥ 333)	Difference in % (95% confidence interval)
No (%) of patients choosing integrated care	251 (75)	207 (62)	13 (6 to 20)*
No (%) of patients perceiving disadvantages of integrated care	123 (37)	166 (50)	-13 (-20 to -5)*
No (%) of patients perceiving advantages of integrated care	132 (40)	158 (47)	-7 (-15 to -0·3)*
No (%) of patients perceiving attributes of general practitioner an advantage of integrated care	36 (11)	17 (5)	6 (2 to 10)*
No (%) of patients "very satisfied" with medical care over past year	263 (77)	284 (86)	-9 (-12 to -0·5)*

*P < 0·05.

TABLE VII—*Variables showing significant effect of type of care received on ownership of peak flow meter. Values are means (95% confidence intervals)*

Outcome*	Integrated care	Conventional care	Ratio (95% confidence interval)
Hospital admissions:†			
Patients who did not own a peak flow meter at beginning of study	0·10 (0·06 to 0·14)	0·06 (0·04 to 0·09)	1·76 (1·09 to 2·85)§
No disturbed nights:‡			
Patients who already owned a peak flow meter at beginning of study	0·92 (0·58 to 1·46)	0·48 (0·31 to 0·74)	1·92 (1·02 to 3·64)§

*Tests for interaction were conducted on 14 variables.
†Means were estimated from Poisson regression models after controlling for initial peak flow expiratory volume in one second (as % of predicted), and duration and severity of asthma.
‡Odds of having no disturbed nights/week against some disturbed nights/week, estimated from binomial regression models after controlling for initial peak flow, forced expiratory volume in one second (as % of predicted), and duration and severity of asthma.
§P < 0·05.

fore they may be considered as having more troublesome symptoms than those who were not referred. Despite this, clinical outcome (including pulmonary function, prescriptions for asthma drugs, morbidity, and hospital admissions) did not differ significantly between those in integrated care and those who continued three monthly clinic attendance. Indeed, conventional patients made a similar number of visits to their general practitioner for asthma as did those receiving integrated care. This suggests that the reduction in direct specialist contact was not associated with worse asthma management, and that regular contact with general practice, with distant consultant supervision, provides care as effectively as more coventional outpatient clinic attendance. Analysis of the interactions between integrated or conventional care and the other innovations evaluated by the study (self monitoring of peak flow and personalised, computer supported education) showed no consistent pattern.

Our results suggest that, once new patients have been introduced to the scheme, they too appreciate its advantages, though not without reservations. Any "credibility gap" in patients' perceptions of integrated care is likely to be most acute among those who have become long term attenders at outpatient clinics. Hence effort should be made to establish patients' confidence in the ability of general practitioners to manage effectively those with moderate asthma. The general perception of hospital consultants as experts and general practitioners as "generalists" is neither easily nor quickly dispelled.

The selection of appropriate patients for integrated care is an issue requiring discussion between general practitioners and consultants. Leitch and colleagues found that the morbidity of patients with stable respiratory values and randomised to attend outpatient clinics every three months was similar to that of those randomised to attend annually.[38] But at the end of their study, general practitioners and hospital doctors agreed that patients attending annually had been attending a clinic too infrequently.

The support and active participation of general practitioners is clearly vital to the successful running of integrated care. Many have discussed the perceived roles of general practitioners and specialists and the doubt that exists about the primacy of the general practitioner.[12 13 39 40] But van Damme found that the Grampian study had achieved the support of participating general practitioners because it had increased their involvement in the management of moderately severe asthmatic patients and allowed them to consolidate their role as primary carers.[41]

The reforms that have overtaken the Health Service since this study began have given general practitioners even greater influence over the future conduct and development of integrated care. Although the NHS Management Executive and the Scottish Health Service Advisory Council encourage shared care,[42 43] the key to its development seems to lie with fundholding general practitioners.

Given the clinical effectiveness of integrated care, the costs to all participants (general practitioners, providers, and patients) are crucial. Whether providers gain or lose from the introduction of integrated care will depend on their circumstances and the choice of a computer system to operate integrated care. This study used the patient record system, which is now being extended and updated. Hickman *et al* have identified ways of conducting integrated care without the facility of a computer.[32] If providers were to pass on the savings that accrue from the introduction of integrated care, these could cover the increased costs to general practitioners that result from their increased involvement in the care of patients with asthma.

Clinical implications

- British Thoracic Society guidelines on asthma management recommend closer liaison between primary and secondary care
- Integrated (or shared) care allows systematic management of chronic disease by community and hospital based practitioners
- This study shows that integrated care for moderately severe asthma patients is as clinically effective as routine outpatient care
- Patients receiving integrated care for asthma preferred it and experienced financial savings

General practitioners can make further savings in the cost of caring for patients with asthma by providing specialised clinics for which reimbursement may be claimed; asthma clinics run by nurses enhance the cost effectiveness of integrated care for asthma in general practice.[44] In addition, the quarterly review period that was generally maintained throughout the Grampian study may be too frequent for some patients. Integrated care allows either general practitioner or consultant to decide the review period, and additional saving may accrue from less frequent attendance.

We conclude that integrated care for moderately severe asthma is clinically as effective as conventional outpatient care, is cost effective, and is an attractive management option for patients, general practitioners, and hospital consultants.

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Effectiveness of routine self monitoring of peak flow in patients with asthma

Grampian Asthma Study of Integrated Care (GRASSIC)

Abstract

***Objective*—To evaluate the effectiveness of routine self monitoring of peak flow for asthma outpatients.**

***Design*—Pragmatic randomised trial.**

***Setting*—Hospital outpatient clinics and general practices in north east Scotland.**

***Main outcome measures*—Use of bronchodilators and inhaled and oral steroids; number of general practice consultations and hospital admissions for asthma; sleep disturbance and other restrictions on normal activity; psychological aspects of health including perceived control of asthma.**

***Results*—After one year there were no significant differences between patients randomised between self monitoring of peak flow and conventional monitoring. However, those given a peak flow meter recorded an increase in general practice consultations that was nearly significant. Among patients whose asthma was judged on entry to be more severe, those allocated to self monitoring used more than twice as many oral steroids (2·2; 95% confidence interval 1·1 to 4·6). Patients who already possessed a peak flow meter at the start of the study recorded higher morbidity over the course of the year than those eligible for randomisation.**

***Conclusion*—Prescribing peak flow meters and giving self management guidelines to all asthma patients is unlikely to improve mortality or morbidity. Patients whose asthma is severe may benefit from such an intervention.**

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Introduction

In October 1990 mini peak flow meters were made available on prescription in the United Kingdom, in response to several years of campaigning by the medical profession and the National Asthma Campaign for the wider use of what was regarded as a crucial instrument in asthma control. The device has been thoroughly validated as an accurate measure of peak expiratory flow rate,[1] which is highly correlated with other measures of pulmonary function.[2] Predictive values for flow rate have been calculated.[3] Furthermore, the device is inexpensive, simple to use, and easy for patients to understand.[4] While spirometry remains the usual method of assessing pulmonary function in hospital practice, peak flow meters have become widely used in the management of patients by general practitioners.[5] Many patients are being given peak flow meters to take home, or are acquiring them themselves, and the British Thoracic Society has recommended the use of home recordings for good asthma management.[6]

There have, however, been few controlled studies of the effectiveness of mini peak flow meters in self management of asthma. Beasley *et al* issued peak flow meters and self management guidelines to 36 patients and recorded significant improvements in objective and subjective measures of asthma severity over six months, but their study lacked a control group.[7] Janson-Bjerklie and Schnell, in a controlled design, issued meters to 15 patients, who reported decreased use of prescribed bronchodilators over two to three months, but no difference in symptoms.[8] Charlton *et al* compared peak flow and self management plans based on symptoms and found no significant difference between patients.[9] They concluded that issuing patients with peak flow meters alone would not improve asthma control.

The Grampian asthma study of integrated care was designed to evaluate the effectiveness of self monitoring of peak flow, integrated care, and personalised, computer based education for asthma patients. This paper reports our evaluation of peak flow self monitoring. The evaluations of integrated care and enhanced education are reported separately.[10 11]

Method

The Grampian asthma study of integrated care was constructed as a 2×2×2 randomised trial[12]: patients were independently assigned at random between self monitoring and conventional monitoring of peak flow; between integrated and conventional care; and between enhanced education and conventional education. Patients who already owned a peak flow meter were excluded from randomisation for that dimension of the study but were considered for randomisation on the two remaining dimensions.

Patients who were over 16 years, had their diagnosis of asthma confirmed by a specialist, had pulmonary function reversibility of 20% on treatment, were attending outpatient chest clinics in Aberdeen, Banff, Elgin, and Peterhead, and were not already in