



# Asthma education

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## KEYWORDS

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**Summary** Education about asthma and self-management of asthma are now key recommendations of asthma management guidelines. A Cochrane systematic review of 12 RCTs found that limited education programmes that offer information about asthma but not self-management skills did not reduce hospitalisation rates or visits to the doctor for asthma. The positive outcomes from limited asthma education were a reduction in symptoms. Asthma self-management education which consists of information, self-monitoring, regular medical review, and a written action plan is effective and leads to a reduction in hospitalisation and ER visits for asthma, unscheduled doctors visits, days lost from work, episodes of nocturnal asthma, indirect costs and an improvement in quality of life. The effects were large enough to be of both clinical and statistical significance. While a structured asthma self-management programme is effective in a hospital setting, attempts to deliver these programmes in primary care have met with varying success.

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## Introduction

Over the last decade, much progress has been made in the management of asthma. Many countries and professional organisations have published asthma management guidelines that recognise the critical role of daily anti-inflammatory medication in the management of asthma.<sup>1–3</sup> An unacceptably high level of morbidity and mortality related to asthma still persists in spite of substantial advances in our understanding of this disease and its management.

In an attempt to improve the management of asthma, practitioners have targeted asthma education and patient adherence. Systems to implement these strategies have been developed and include asthma self-management programmes, written

management plans and primary care based asthma clinics. This article will examine the Cochrane Systematic Reviews which evaluate these interventions to improve asthma management. In particular, the review addresses:

Does effective education require more than provision of information?

What are the important components of comprehensive asthma self-management education? Does more intense self-management education lead to greater effect?

Is a written action plan enough or is additional self-management education needed?

## Asthma education

Patient education has been defined as “a planned learning experience using a combination of methods such as teaching, counselling, and behaviour modification techniques which influence patients’

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knowledge and health behaviour...(and) involves an interactive process which assists patients to participate actively in their health care".<sup>4</sup>

There is general agreement that asthma education improves patient knowledge; however, the effects on other health outcomes depends heavily on the type of education programme that is provided. Broadly, asthma education programmes can provide information about asthma, or teach participants how to manage their asthma in conjunction with a doctor (self-management), or both.<sup>4</sup> A comprehensive asthma self-management programme is needed to improve asthma outcomes.

### Components of asthma education programmes

Four main components of asthma education programmes can be identified, and are described below. This review examines the effects of education programmes, classified in terms of these 4 components. Interventions that provide 2 or more components are termed self-management education. Interventions using all 4 components are termed optimal self-management education.

- *Information*: This is the transfer of information about asthma and its management.
- *Self-monitoring*: This involves regular assessment of either symptoms or peak expiratory flow by the participant.

- *Regular medical review*: The assessment of asthma control, severity and medications by a medical practitioner forms the basis of the regular medical review component.

- *A written action plan*: This is an individualised written plan produced for the purpose of patient self-management of asthma exacerbations. The action plan is characterised by being individualised to the patient's underlying asthma severity and treatment. The action plan also informs the patient when and how to modify medications and when and how to access the medical system in response to worsening asthma.

### Providing information about asthma

The provision of information about asthma and its treatment is one of the simplest and more economical forms of asthma education. It can be easily conducted in either a hospital or community setting. The evidence-base for examining the effects of an information only intervention on asthma outcomes consists of 12 RCTs that are summarised in a Cochrane systematic review of limited (information only) education for asthma<sup>5</sup> (Tables 1 and 2).

### Teaching modalities of asthma education

Information about asthma can be delivered to the participant in either an interactive or non-inter-

**Table 1** Trial inclusion criteria for the Cochrane systematic reviews.<sup>5,9</sup>

Limited (information only) patient education programs for adults with asthma<sup>5</sup>

*Types of trials*: Randomised and quasi-randomised controlled trials which studied the effects of limited asthma education (information only) on health outcomes in adults with asthma

*Types of participants*: Adults greater than 16 years of age with asthma that was defined by doctor's diagnosis or objective criteria.

*Types of interventions*: Asthma education programs that were delivered to a person or group of people with asthma (not their doctor). The intervention may have transferred information about pathophysiology of asthma, management or triggers and actions and side effects of medications. Trials were excluded if they comprised components of asthma self-management such as peak expiratory flow monitoring and diary recording, provision of a written action plan, assessment and or modification of medical therapy.

Self-management information and regular practitioner review for adults with asthma<sup>9</sup>

*Types of trials*: Randomised and quasi-randomised controlled trials, which studied the effects of asthma education and self-management on health outcomes in adults with asthma.

*Types of participants*: Adults greater than 16 years of age with asthma defined by doctor's diagnosis or objective criteria according to American Thoracic Society guidelines.

*Types of interventions*: Asthma education programs that provided both information about asthma plus components of self-management by the inclusion of either self-monitoring, regular medical review for medication adjustment, or a written action plan that was individualised for the purpose of patient self-management of exacerbations.

**Table 2** Summary characteristics of trials included in the Cochrane systematic reviews.<sup>5,9</sup>

Limited (information only) patient education programs for adults with asthma <sup>5</sup>	Self-management intervention and regular practitioner review for adults with asthma <sup>9</sup>
<p><i>Primary comparison:</i> Information only education versus a usual care control group. The control comparisons (or usual care) varied from usual medical care and a waiting list control.</p> <p><i>Types of participants:</i> Participants were adults with asthma and recruited from outpatient clinics, GPs, hospital emergency departments and advertising.</p> <p><i>Setting:</i> The intervention was performed in hospital clinics/outpatient departments in 6 trials, GP clinic for 1, hospital exit interview in 1 and combined at home and hospital in 4.</p> <p><i>Types of interventions:</i> The type of intervention varied between trials. It included either interactive sessions (group or individual education or interactive computer sessions) or non-interactive education (provision of written material, video and or audio-cassette).</p> <p><i>Trial duration:</i> The duration of the intervention varied amongst the trials and was also dependent on the style of intervention. This varied from the time taken for home reading of a booklet, a single interview with an educator or watching a video to 20 h of instruction over a 4-week period.</p>	<p><i>Primary comparison:</i> The primary comparison based on the treatment of the intervention and control groups used was self-management versus usual care. Usual care may have included education, self-monitoring, or regular medical review. However, no control group received a written action plan.</p> <p><i>Types of participants:</i> 6090 adults with asthma were randomised into 36 trials. Participants were recruited from a variety of settings including hospitals, emergency departments, outpatient clinics, GPs, and community settings.</p> <p><i>Setting:</i> The interventions were conducted in outpatient clinics, GP asthma clinics, community based programs and hospital inpatients education programs.</p> <p><i>Types of interventions:</i> All of the interventions provided information plus components of self-management. The interventions fell into five subgroups according to the type of self-management intervention. These included: Optimal self-management (information, self-monitoring, regular medical review and written action plan), 15 trials; Self-monitoring and regular review, 7 trials; Self-monitoring only, 10 trials; Regular medical review only, 2 trials; and inclusion of a written action plan but not an optimal intervention, 2 trials.</p> <p><i>Trial duration:</i> Duration of intervention varied from a minimum of one 45 min session, 10 h of instruction over a 4-week period. Follow-up consisted of monthly visits or telephone follow-up for 12 months.</p>

active style.<sup>5,6</sup> Interactive learning can incorporate either individual or group sessions with an educator, and may involve lectures: audiovisual presentations to encourage discussion, group discussions, demonstration of techniques, practice of skills, role playing, project or assignment based learning, participatory learning and case method to develop problem solving skills.<sup>6</sup> Seven randomised controlled trials have conducted interactive interventions.<sup>4,5</sup> Individual and group interactive education lead to similar and significant improvements in symptoms, however group programmes are simpler to administer, more cost effective, and better received by patients and educators.<sup>7</sup>

### Non-interactive interventions

Non-interactive interventions comprised written materials, audiocassette, video or non-interactive

computer education that was administered without direct contact with an educator. Five RCTs have examined the effects of non-interactive methods to transfer information about asthma.<sup>5</sup> Overall these studies showed a significant improvement in asthma knowledge with no significant effects on asthma morbidity. In the largest study conducted using this modality, Osman et al. found no significant differences in asthma outcomes,<sup>8</sup> however, in the study conducted by Wilson et al. the non-interactive education group experienced significantly fewer symptomatic days and better asthma status.<sup>7</sup>

### Summary

There is significant variability in the results of studies that provide information about asthma as a sole intervention. When the results are pooled in a meta-analysis, the results show that education

programs that offered knowledge but no self-management skills did not reduce hospitalisation rates or visits to the doctor for asthma.<sup>5</sup> Similarly there was no change in medication use or improvement in lung function after information only education. The positive outcomes from these programmes (Fig. 1) were a reduction in symptoms and in emergency department (ED) visits. Patients reported that their perception of symptoms was reduced by provision of information about asthma. There was a gradation of effect with no reduction in the more severe symptoms such as days off work or school. It is unclear whether the reduction in perceived symptoms is a true effect of the intervention on asthma symptoms or due to anticipation bias as a result of using an unblinded intervention.

### Asthma self-management intervention

The effects of an asthma self-management intervention on asthma outcomes has been evaluated in 36 RCTs involving 6090 participants<sup>9</sup> (Tables 1 and 2). The content of the asthma self-management interventions described in the 36 studies is shown in Table 3.

Interventions using all 4 components are considered to provide an optimal self-management programme. There were 15 studies that compared an optimal self-management programme, or its components, to usual care. The studies showed that with a self-management programme, there was a reduction in the proportion of subjects reporting hospitalisations and ER visits for asthma, unscheduled doctors visits for asthma, days lost from work due to asthma, and episodes of nocturnal asthma. The effects were large enough

to be of both clinical and statistical significance (Table 4). There was also a gradation of effect. Those interventions which included a written action plan, consistently showed an effect, whereas less intense interventions were not always

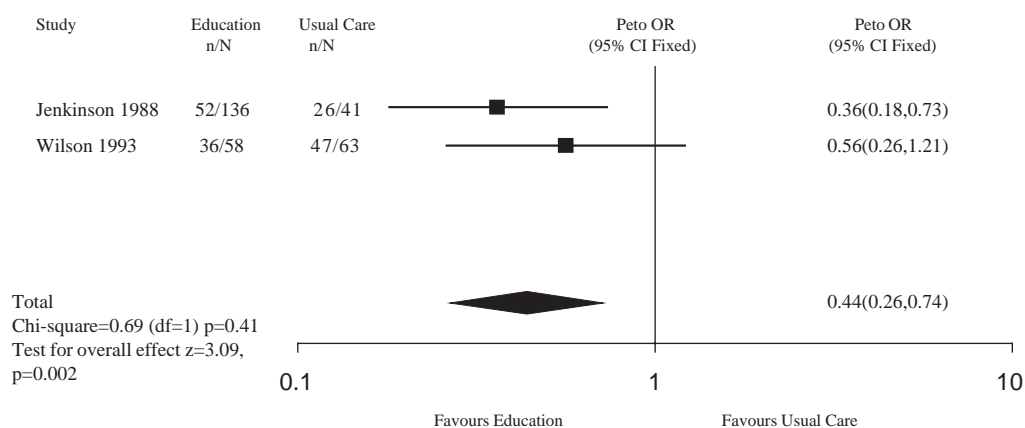
**Table 3** A systematic review of asthma self-management.<sup>9</sup>

Types of interventions studied	Number of studies (%)
Information	36 (100%)
Self-monitoring	33 (92%)
Regular review	24 (67%)
Written action plan	18 (50%)
Optimal self-management intervention	15 (42%)

**Table 4** Outcomes of asthma self-management.<sup>9</sup> Relative risk with 95% CI. All results  $P < 0.05$ .

	Overall	Optimal self-management intervention
Hospitalisation	0.64 (0.50–0.82)	0.58 (0.43–0.77)
Emergency visits	0.82 (0.73–0.94)	0.78 (0.67–0.91)
Unscheduled doctor visits	0.68 (0.56–0.81)	0.73 (0.58–0.91)
Days off work	0.79 (0.67–0.93)	0.81 (0.65–1.01)
Nocturnal asthma	0.67 (0.56–0.79)	0.57 (0.45–0.72)
PEF, l/min	0.18 (0.07,0.29)*	0.20 (0.08–0.31)

\*Standardised mean difference.



**Figure 1** Effects of limited education about asthma compared to usual care on asthma symptoms (perceived disability).

of obvious benefit. Airway function was assessed as either clinic forced expiratory volume in 1 s (FEV<sub>1</sub>) (10 studies) or peak expiratory flow (PEF) (16 studies). There was an overall positive effect of asthma self-management which led to an improvement in PEF ( $P < 0.05$ ). The absolute improvement in PEF was small (14.5 l/min), and significant heterogeneity was present for both analyses ( $\chi^2 30.13$ ,  $P < 0.05$ ). There was no effect on clinic FEV<sub>1</sub>.

## Components of asthma self-management

### Optimal pharmacotherapy

There is an important interaction between asthma self-management and optimal pharmacotherapy. Asthma education can improve adherence<sup>10</sup> and thereby facilitate the use of pharmacotherapy. Guidelines recommend that asthma education be delivered together with pharmacotherapy. When this happens, as in an optimal asthma self-management programme, then there is a significant improvement in asthma morbidity (Table 4).

Studies have attempted to identify the improvement in asthma that can be attributed to education and separate this from that attributable to therapy.<sup>11</sup> In four RCTs, there was optimisation of pharmacotherapy prior to administration of an education programme. In these studies, pharmacotherapy was optimised via regular medical review and was compared to regular medical review combined with an optimal self-management programme. These trials also compared two forms of adjustment of medication, usually inhaled corticosteroids, in order to achieve improved asthma control. The usual means was by regular review by a doctor. This was contrasted with self-adjustment by the patient according to written, pre-determined criteria. Overall there was no difference in asthma outcomes between the two forms of asthma management. In particular, hospitalisations for asthma were not different between groups, and unscheduled doctor visits, disrupted days, and lung function were not significantly different.

These results indicate that regular medical review is an acceptable alternative to an asthma education programme, provided that the medical review includes assessment of severity, optimisation of medication and instruction on management of exacerbation.

### Symptoms or PEF self-monitoring

Action plans require regular self-monitoring in order to allow the detection of an asthma exacer-

bation. Self-monitoring can consist of either symptoms and/or PEF diaries. Self-management using a written action plan based on PEF was found to be equivalent to self-management using a symptoms based written action plan in the six studies which compared these interventions for the proportion of subjects requiring hospitalisation, and unscheduled visits to the doctor. Emergency room visits were significantly reduced by PEF self-management in one study<sup>12</sup> but were similar to symptoms self-management in four other studies. Symptoms-based self-management reduced the number of subjects requiring a course of oral corticosteroids in one study.<sup>13</sup>

This is an important issue since self-monitoring of PEF involves the regular measurement of PEF and recording the best of three measurements in a diary, morning and night. Medication is then adjusted according to changes in PEF levels. In contrast, adjustment of medications can be made according to the patient's symptoms such as nocturnal asthma or an increased need for reliever medication. Both PEF and symptom self-monitoring have their limitations. Compliance with PEF monitoring in the long term is poor and some patients are poor perceivers of their symptoms. In reviewing the six trials that compared PEF and symptom self-monitoring no significant differences in health outcomes were found suggesting that the use of either method is effective. This is a clinically important observation as self-monitoring can be tailored to patient preference, patient characteristics and the resources available.

### Adherence

Patient adherence, which has been defined as the extent to which a patient's behaviour is consistent with that prescribed by the doctor, is an area which is seen as being important because of the relationship between health related behaviour and the short and long-term outcomes of disease.<sup>14,15</sup>

Research to identify risk factors for non-adherence has shown factors such as age, sex, objective measures of disease severity and subjects' educational level to be associated with low adherence of patients to their treatment, although this observation can be inconsistent across populations. Other factors that are significantly related to the level of adherence include complexity of the treatment regimen, socio-economic barriers, side effects of treatment and denial of the illness.<sup>16</sup> Although the area of patient adherence is complex, one of the enduring beliefs in clinical practice has been that provision of written instructions to patients is an

**Table 5** Trial inclusion criteria for the Cochrane systematic reviews.<sup>17,18</sup>

Written individualised management plans for asthma in children and adults <sup>17</sup>	Primary care based clinics for asthma <sup>18</sup>
<i>Types of trials:</i> To be selected trials had to be randomised controlled trials. Patients in these trials must have been given individualised written instructions about the actions required for regular asthma management and/or the actions to take in the event of an asthma exacerbation. The only difference between the intervention and control groups was the provision of individualised written instructions.	<i>Types of trials:</i> Only randomised controlled trials of any duration were considered for inclusion. Trials must have recruited patients into a regular primary care based asthma clinic ran by either nurse or other relevant health care professional.
<i>Types of participants:</i> Patients were adults and children who had a clinical diagnosis of asthma and had written instructions given to them by a doctor (or other health care professional) and requiring frequent use of asthma medications to manage their asthma.	<i>Types of participants:</i> Patients with asthma who must be participants in a primary care led, organised, and structured asthma clinic. Comparisons can be made between different types of care e.g. non-organised or best clinical practice or alternative methods of primary care led structured care process.
<i>Types of interventions:</i> Trials were considered if the only intervention in the active group was the provision of written management plans. Different types of written management plans (peak flow versus symptom based) were also considered. Studies involving multiple interventions were excluded.	<i>Types of interventions:</i> Primary care based practices, which offer a pro-active system of care by organised asthma clinics within the primary care setting. Practices that undertake shared care with hospital services were also considered for inclusion.

effective tool for ensuring good patient compliance with therapy.

### Written management plans as the sole intervention

A recent Cochrane review<sup>17</sup> addressed the question of whether providing written management instructions to patients' influences asthma outcome measurements (Table 5). This review addressed the provision of written management plans only, and did not include studies that involved additional methods used for self-management including asthma education and regular medical review, which are addressed in another Cochrane review.<sup>9</sup>

This review on the effectiveness of individual written management examined the benefit of providing a written management plan on the following outcomes: hospitalisation, ED visits, oral corticosteroid use, lung function, days lost from school or work, unscheduled doctor visits and respiratory tract infections. Six trials were identified as meeting the entry criteria for the review (Table 5). Their written management plans were either peak flow or symptom based. Some of the trials compared the two different approaches, whilst others compared self-management with no self-management (Table 6). None of the reported outcomes in this review showed a statistically significant effect, whether written management

plans were compared to no written plans or when peak flow based plans were compared to symptom based plans. There are too few data from these trials to confirm whether or not written asthma management plans as an isolated intervention are effective in improving asthma outcomes.

### Primary care based asthma clinics

In addition to the provision of written asthma management plans there has been a proliferation of primary care based asthma clinics in the hope that they would improve asthma outcomes. Unfortunately, little has been published on the effectiveness of this system of care and its potential to improve asthma outcomes. Even less is known about patients' views on these clinics. A primary care based asthma clinic is normally nurse led, usually doctor supported, and involves organised recall of patients with asthma for symptom review and input from a variety of educational models. The effectiveness of this system has received only limited evaluation in the form of randomised controlled trials against "usual care". A recent Cochrane review addressed the effectiveness of organised care through primary care based asthma clinics.<sup>18</sup> Unfortunately, only one trial met the inclusion criteria for the review (Tables 5 and 6). This trial provided 11 outcome measures of which two showed a significant effect of the intervention.

**Table 6** Summary characteristics of trials included in the Cochrane systematic reviews.<sup>17,18</sup>

Written individualised management plans for asthma in children and adults <sup>17</sup>	Primary care based clinics for asthma <sup>18</sup>
<p><i>Primary comparison:</i> Individualised written asthma management plan versus control participants who received no written instructions.</p> <p><i>Types of participants:</i> All trials included patients with well-established asthma. Mean age for patients ranged from 28 to 36 years. Patients who previously had a written action plan or those requiring &gt;7.5 mg/day of prednisone to control their asthma were excluded.</p> <p><i>Setting:</i> Trials had moderate sample sizes ranging from 72 to 150 patients. Three studies were conducted in tertiary hospitals three studies were conducted in primary care settings through family physicians.</p> <p><i>Types of intervention:</i> The types of intervention varied between studies. They included either peak flow or symptom based written plans compared to controls or both types of plans compared directly against each other.</p> <p><i>Trial duration:</i> The duration of intervention in three trials was 6 months and in another three, it was 12 months.</p>	<p><i>Primary comparison:</i> Primary care based asthma clinics, which offer a pro-active system of care compared to no asthma clinics.</p> <p><i>Types of participants:</i> Patients with asthma who are participants in a regular primary care based, organised, and structured asthma clinic.</p> <p><i>Setting:</i> 195 adult patients with mean age 26–27 years. Eight primary care practices (staffed by 42 general practitioners) in South Australia.</p> <p><i>Types of intervention:</i> Each primary care practice operated one three-hour asthma clinic session per week. The asthma educators in the trial were registered nurses with extensive experience in respiratory care.</p> <p><i>Trial duration:</i> There was only one included trial in this review, which had duration of 6 months.</p>

More patients in the intervention group had peak flow meters (RR 1.30, 95%CI 1.05–1.61) and fewer patients in the intervention group were likely to wake up at night as a result of their asthma (RR 0.30, 95%CI 0.16–0.81). Due to limited evidence of benefit from primary care based asthma clinics firm conclusions cannot be formed until further good quality trials have been conducted.

### Applicability of findings

Although some of the included trials in these two reviews mentioned above were conducted in a secondary care setting, the majority of the included trials were conducted in primary care. In the written management plan review<sup>17</sup> three trials each were conducted in primary and secondary care. In the second review on primary care based asthma clinics<sup>18</sup> there was only one included trial, which was conducted in primary care (Tables 6 and 7). We have no reason to believe that the results of the included trials conducted in secondary care would not also apply to patients in the primary care setting. Included trials which were conducted in secondary care utilised the facilities and staff of the secondary care institute however in most instances patients were recruited from the community and those patients who were being discharged into the community after a period as

**Table 7** Number needed to treat (NNT) for optimal self-management programme.<sup>9</sup>

	NNT
Hospitalisation	21
Emergency visits	16
Unscheduled doctor visits	21
Days off work	12
Nocturnal asthma	7

inpatient. Combining these different trial results in a meta-analysis did not produce statistical heterogeneity, adding further to the argument that the results from the two settings are not mutually exclusive.

### Conclusion

Asthma education is a key part of asthma management. Providing information about asthma and its treatment is seen as necessary to the development of a successful therapeutic alliance between the person with asthma and their health professional. The practical results are improved understanding of asthma and reduced asthma symptoms. In common with other chronic diseases, the provision of information about asthma can improve knowledge

but result in little behaviour change.<sup>19,20</sup> Thus, the effects of an information-only asthma intervention on other health outcomes are small, particularly when compared to asthma self-management programmes. In the ED setting however, even provision of information about asthma may have a positive effect of reducing future ED visits.

Guided self-management, information and regular medical review<sup>9</sup> have been evaluated and shown favourable outcomes. The benefits are a clinically significant reduction in hospitalisation and other measures of morbidity. Most asthma self-management programmes have been conducted in secondary or tertiary care settings. Primary care asthma clinics have been established to duplicate these results, however it is not clear whether these results are applicable to all patients whose asthma is managed within primary care.<sup>21</sup> Traditionally, the educational role of asthma clinics has been accorded great importance in the literature and is emphasised in training courses attended by majority of asthma nurses. Much of the value of these clinics has been seen to rest in the opportunity afforded in self-management and ensuring that patients fully appreciate the reasons for the medication and treatment regimen prescribed. It has been pointed out that whilst patient education can be effective in reducing short and medium-term morbidity, this is only true for the interested minority that respond to invitations to participate.<sup>19,22</sup> Many studies comment on the poor response and attendance by patients. The number of randomised controlled trials in this area is limited and to date only two trials have explored the clinical, social, demographic and other relevant characteristics of attendees and non-attendees.<sup>23</sup> Overall, little is known about attendance, however, it is clear that if non-attendance is an indicator of potential patient dissatisfaction, this could also become an issue. Average attendance rates range from 30% to 43%.<sup>19,24,25</sup> Whilst it is clear that an asthma self-management programme is effective, a number of questions remain: how best to manage these patients in primary care, whether in organised asthma clinics or in normal surgery time with planned follow-up or opportunistically on an acute basis? Accessing and using evidence in this area is likely to have important resource implications.

### Box points

- Providing information about asthma alone improves knowledge and may reduce symptoms. It does not alter other health outcomes

- An asthma self-management programme consistently improves asthma outcomes, such as hospitalisations
- Either symptoms or PEF can be used for monitoring
- An effective asthma self-management programme (ASMP) involves information, self-monitoring, regular medical review and a written action plan
- The best system for providing ASMP in primary care is not known.

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