

Written individualised management plans for asthma in children and adults (Review)

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ABSTRACT

Background

Non-adherence to treatment advice is a common phenomenon in asthma and may account for a significant proportion of the morbidity. Comprehensive care that includes asthma education, a written self-management plan and regular review has been shown to improve asthma outcomes, but the contribution of these components has not been established.

Objectives

To determine whether the provision of a written asthma self-management plan increases adherence and improves outcome.

Search strategy

We carried out a search on the Cochrane Airways Group trials register. There was no language restriction. The search of the databases used the following terms: action plan OR self OR self-care OR self-manag* OR educ* AND adher* OR comply OR compli*. We contacted authors of included studies for any unpublished or on-going studies and bibliographies of all included studies and reviews were searched for further studies. The most recent search was carried out in June 2004.

Selection criteria

We only considered randomised controlled trials (RCTs) in patients with asthma. Participants must have been assigned to receive an individualised written asthma management plan (symptom or peak flow based) about the actions required for regular asthma management and/or the actions to take in the event of an asthma exacerbation.

Data collection and analysis

Two reviewers independently assessed study quality and abstracted data.

Main results

Seven trials met the inclusion criteria. The written management plans were either peak flow or symptom based, which were compared against each other or compared to no written management plan. Reported outcomes included: medication adherence, hospitalisation, emergency department visits, oral corticosteroid use, lung function, days lost from school/work, unscheduled doctor visits and respiratory tract infections. There was no consistent evidence that written plans produced better patient outcomes than no written plan. For some outcomes, there appeared to be an advantage of one type of plan over the other, but there was no consistency - one type of plan was not consistently more effective than another.

Authors' conclusions

The available trials are too small and the results too few and inconsistent to form any firm conclusions as to the contribution of written self management plans in the known beneficial effects of a comprehensive asthma care programme.

PLAIN LANGUAGE SUMMARY

There is not enough evidence from trials to show that personalised, written self-management plans for asthma, as the sole intervention, improves health outcomes. The provision of clear written instructions to patients is good clinical practice. Due to the paucity of evidence from trials, the extent to which provision of a written individualised asthma management plan improves adherence is not known. There is a need to conduct further trials that specifically address the effectiveness of written asthma management plans. The results from this review suggest that to change asthma management behaviour and improve health outcomes requires a coordinated approach of self-management education, regular review and a written action plan.

BACKGROUND

Over the last decade, a lot of progress has been made in the management of asthma. Many countries and professional organisations have published asthma management plans and these guidelines recognise the critical role of daily anti-inflammatory medication in the management of asthma (NHLBI 1995; NAC 1996; NIH 1997). An unacceptably high level of morbidity and mortality related to asthma persists in spite of substantial advances in our understanding of this disease and its management. A previous review by Gibson 1998 has shown that self-management education, regular review and a written action plan leads to improved health outcomes for adults). However, the studies in that review used interventions that included much more than just the provision of a written individualised plan. 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 (RPS 1997).

Across a range of diseases and illnesses patient adherence to management guidelines has been shown to be variable and, in the majority of studies, much less than prescribed. Patient adherence in the area of asthma has been shown to be between 30 and 70% (Rand 1994). This suggests that non-adherence is a common phenomenon and may account for a significant proportion of the continued morbidity associated with patients with asthma even after appropriate treatments have been prescribed.

Research to identify risk factors for non-adherence has shown that factors such as age, sex, objective measures of disease severity and subjects' educational level are not generally associated with patient adherence. Factors that are significantly related to adherence include complexity of the treatment regimen, socio-economic barriers, side effects of treatment and denial of the illness (Mellins 1992).

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 effective tool for ensuring that the patient is compliant with the prescribed management actions. This review addresses the question of whether giving written management instructions to patients influences their level of adherence.

OBJECTIVES

The primary objective of this review was to determine whether providing a person who has asthma with an individualised written asthma management plan increases adherence to specified asthma management behaviours, as detailed in the individual components of the written plan (i.e. primary outcome measures). A secondary objective was to observe the effect of individualised management plans on clinical outcomes (i.e. secondary outcome measures).

CRITERIA FOR CONSIDERING STUDIES FOR THIS REVIEW

Types of studies

Studies had to be randomised controlled trials (RCTs). Participants in these studies 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.

Types of participants

Participants 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 required frequent use of asthma medications to manage their asthma.

Types of intervention

For inclusion, participants must have been randomly assigned to receive an individualised written asthma management plan about the actions required for regular asthma management and/or the actions to take in the event of an asthma exacerbation. Control participants must have been randomly assigned to receive no written instructions.

We considered studies for inclusion if the only intervention in the active group was the provision of written management plans. We also considered studies if different types of written management plans (peak flow versus symptom based) were being compared. Studies involving multiple interventions (e.g. exercise, psychological interventions, phone interviews, breathing retraining, dietary

interventions) along with the provision of written management plans were not considered for inclusion as this would have meant that any benefit could not be ascribed solely to the provision of written management plan. We considered studies where necessary education and health care provider review was required as part of the provision of the written management plan, as long as the groups being compared were the same.

Types of outcome measures

PRIMARY OUTCOME MEASURES

Compliance/Adherence (to use of asthma medications, peak flow meter usage, monitoring symptoms)

SECONDARY OUTCOME MEASURES

Increased or altered medication use in response to exacerbations
Symptoms scores (using validated scales e.g. Borg score or the Visual Analogue scale)

Lung function (e.g. forced expiratory volume in one second (FEV1), forced vital capacity (FVC))

Exacerbations requiring medical intervention

Emergency Department visits

Hospitalisations

Days lost from work/school due to asthma

SEARCH METHODS FOR IDENTIFICATION OF STUDIES

See: Cochrane Airways Group methods used in reviews.

We carried out a search on the Cochrane Airways Group trials register. There was no language restriction.

The search of the database used the following terms:
action plan OR self OR self-care OR self-manag* OR educ*
AND adher* OR comply OR compli*

We also completed a search of the Cochrane Central Register of Controlled Trials (CENTRAL) using the same search strategy.

We contacted authors of studies to locate other unpublished or on-going studies and searched bibliographies from included studies, reviews and texts for further citations.

The most recent search was carried out in June 2004.

METHODS OF THE REVIEW

Initially two reviewers independently evaluated the titles, abstracts and citations of all identified trial abstracts to select those that may meet the inclusion criteria. Studies selected in this first phase were subjected to full text review to establish whether they meet the inclusion criteria. Agreement between reviewers was measured by simple agreement and kappa statistics. Any disagreements were resolved by discussion and consensus.

QUALITY ASSESSMENT

Both reviewers subjected included studies to quality assessment independently. Using the Cochrane Collaboration approach to the assessment of allocation concealment all trials were graded using the following grades:

Grade A - Adequate allocation concealment

Grade B - Unclear allocation concealment

Grade C - Inadequate allocation concealment

Grade D - Allocation concealment not used

DATA EXTRACTION

Data was extracted from selected studies by the two reviewers independently and cross checked. Data in table or graphic forms were used if available and authors were contacted in order to confirm data extraction and provide any clarification and or additional information for their studies.

STATISTICAL CONSIDERATIONS

All included trials were combined using Review Manager 4.2.2 (RevMan) software.

For continuous variables, we pooled the results of individual studies, using fixed or random effects models with weighted mean differences (WMD) or standardised mean differences (SMD) calculated with 95% confidence intervals (CI). For pooled effects, we carried out a chi-squared test for heterogeneity. We performed funnel plots to test for publication bias. If heterogeneity were found, we would have performed sensitivity analyses using methodological quality as categorising variable. The results of random and fixed effect models were compared as a sensitivity analysis.

PLANNED SUB-GROUP ANALYSIS INCLUDED

- (1) Adults and children
- (2) Setting (general practice versus hospital/specialist clinic)
- (3) Provider (doctor versus other health professional)
- (4) Asthma severity

DESCRIPTION OF STUDIES

Seven trials met the inclusion criteria.

STUDY DESIGN, DURATION, SAMPLE SIZE AND LOCATION

All seven included studies were randomised controlled trials and all followed a parallel study design. The duration of intervention in three trials was six months (Jones 1995; Cowie 1997; Turner 1998) and in the other four, it was 12 months (Charlton 1990; Côté 1997; López-Vina 2000; van der Palen 2001). Most of the trials had moderate sample sizes ranging from 72 to 150 participants in each study but one study included a sample size of 250 (van der Palen 2001). Three of the studies (Cowie 1997; Côté 1997; Turner 1998) came from Canada and one each from the United Kingdom (Jones 1995), Norfolk (Charlton 1990), Spain (López-Vina

2000) and the Netherlands (van der Palen 2001). Four of the studies were conducted in tertiary hospitals (Cowie 1997; Côté1997; López-Vina 2000) where participants were recruited after presenting with an exacerbation of their asthma, the remaining three studies (Charlton 1990; Jones 1995; Turner 1998) were conducted in primary care settings and participants were recruited through family physicians (or general practitioners).

PATIENT CHARACTERISTICS

All seven studies included participants with well-established asthma. Only one study (Charlton 1990) recruited children into their trials; all other included trials included adult patients. Mean age for adult patients ranged from 28 to 45 years however, no data was provided for the mean age of children recruited in the Charlton 1990 trial.

Charlton 1990 recruited participants from a primary care practice with four partners. The authors of this study (Charlton 1990) sent letters to all patients on their repeat prescribing register who were receiving prophylactic treatment for asthma, inviting them to participate in the study.

In Cowie 1997, patients who previously had a written action plan were excluded from the study but patients with peak flow meters were still eligible for entry.

Patients in Côté1997 who were current or ex-smokers and 40 years of age or older and who had < 80% of the predicted FEV1 after salbutamol were excluded. Patients who required > 7.5 mg/day of prednisone to control their asthma and those who had previously taken part in an asthma educational program were also excluded.

Turner 1998 only recruited participants with a baseline PC20 methacholine < 8 mg/ml and those who had a daily requirement for inhaled corticosteroids to manage their symptoms. Patients who previously had a peak flow meter or those that could not use one were excluded. They also stratified all patients according to the severity of their airway hyper responsiveness using values of PC20 methacholine < 2 mg/ml or > 2 mg/ml, randomisation using random number chart followed this stratification.

In the study of Jones 1995, all participants were given a two week course of oral prednisone (40 mg/day) to optimise lung function. Randomisation in blocks of six followed this two week optimisation treatment. To be eligible for recruitment, participants could not exceed 1000 mcg in their daily dose of inhaled corticosteroid and they had to have been using inhaled corticosteroids for minimum of one month before entry into the study. In addition, patients who were on regular oral steroids and those who already possessed a peak flow meter were excluded.

López-Vina 2000 recruited participants who required treatment in an emergency department over an 18-month period because of an episode of acute asthma. Participants had to be aged between 17 to 65 years and had symptomatic disease during the previous year. All patients also had to satisfy the American Thoracic Society definition of asthma, with symptoms of episodic wheezing,

cough and shortness of breath responding to bronchodilators and reversible airflow obstruction documented on at least one previous pulmonary function test.

van der Palen 2001 recruited patients aged between 18 and 65 years from a hospital outpatient database. Patients were included if they had a diagnosis of asthma, had been in a stable phase for the previous six weeks and had been using inhaled steroids for at least 3 months. Patients were sent an invitation letter and contacted by telephone ten days later. All patients who agreed to participate in the study (328/485) were screened at a respiratory lab, and 83 were excluded leaving 245 patients for the study.

INTERVENTION CHARACTERISTICS

The types of intervention varied between studies

• PEAK FLOW BASED WRITTEN PLANS VERSUS SYMPTOM BASED WRITTEN PLANS

Charlton 1990: a 12 month nurse run study where all participants were randomised to receive either peak flow based written management plans or symptom based management plans.

Cowie 1997: a six month long study where all participants received assessment and education for asthma before being allocated to receive a symptom-based action plan or a peak flow based action plan. This study also included a third study arm in which no written action plans were provided, this is listed in the category below.

Côté1997: after optimisation of asthma therapy, participants were assigned to one of three groups, no formal education, education and action plan based on peak flow monitoring or education with action plan based on monitoring of asthma symptoms for 12 months. In this study, the control group differed from the two intervention groups in that it did not receive any education. For this reason, we did not compare the control group with the two written management plan groups.

López-Vina 2000: all participants were randomised to either receive a peak flow based management plan coupled with educational intervention or a symptom based management plan. Participants in the symptom based plan group received the same educational programme as the peak flow based group except for informative pamphlets, dairy cards for symptoms, medication and peak flow meter and they did not receive a colour-coded self-management plan.

Turner 1998: participants were allocated to either written action plan based on peak flow monitoring or written plans based on asthma symptoms, for six months.

• WRITTEN ACTION PLANS (PEAK FLOW OR SYMPTOM BASED) VERSUS NO WRITTEN ACTION PLANS

Cowie 1997: a six month long study where all participants received assessment and education for asthma before being allocated to

receive no action plan or a symptom or peak flow based written plan.

Jones 1995: allocated participants to either written action plan based on peak flow monitoring with regular clinic review or clinic review only (with no written plans), over a six month period.

van der Palen 2001: provided all patients with self-management training then randomly allocated patients to receive a peak flow or symptoms based self-management plan or no self-management plan.

METHODOLOGICAL QUALITY

All studies were randomised and had control groups. Using the Cochrane allocation concealment grading Cowie 1997 and Turner 1998 studies was graded "A", Charlton 1990; Jones 1995; Côté 1997; López-Vina 2000 and van der Palen 2001 were graded "B". Description of dropouts and withdrawals were adequately described in all studies.

RESULTS

INCLUSION

The search identified 131 titles and abstracts, which were screened to identify 37 potentially relevant studies involving written management plans in patients with asthma. One reviewer (FR) initially excluded eighteen studies as being not relevant to the study question, (see Table of Excluded Studies). We obtained full text versions of the remaining 29 studies and both reviewers independently assessed them. The two reviewers (FR, BT) agreed to include seven trials in the review. There was complete agreement between the two reviewers on inclusion and exclusion of studies. An additional update search in June 2004 did not identify any additional trials. Studies that were excluded have their reasons for exclusion noted in the table, "Characteristics of excluded studies". Details of the seven included studies can be found in the table, "Characteristics of included studies". We attempted to contact all authors for verification of methodological quality, classification of the intervention(s) and data verification. No replies have been received to date. One study was included in an

OUTCOMES

The primary outcome considered in this review was adherence. Adherence with medication use was collected with different methods and did not allow formal meta-analysis of results. Results have been summarized for each study and where possible have been presented as MetaView plots.

PRIMARY OUTCOME

PEAK FLOW BASED WRITTEN MANAGEMENT PLANS VERSUS SYMPTOM BASED WRITTEN MANAGEMENT PLANS

Charlton 1990 did not report data of adherence with regular treatment or adherence with the components of the written management plans.

Cowie 1997 did not report data of adherence with regular treatment or adherence with the components of the written management plans.

Côté 1997 defined poor compliance as patients taking less than 60% of prescribed doses over one month. Adherence was measured by covert monitoring of canister weight. After the first month, a significantly greater proportion of subjects in the control group had poor compliance compared with the peak flow and symptom based written plan groups ($p=0.03$). However, at 3, 6, 9 and 12 months after the intervention there was no significant difference in adherence between the three groups.

López-Vina 2000 used the self-report six-item Inhaler Adherence Scale (IAS) to measure adherence. However, instead of using the sum of scores from the IAS they defined adherence as negative responses to all six questions. A total of 83.4% of the peak flow self-management group and 52.2% of the symptom based self-management group were adherent ($p=0.05$).

Turner 1998 used a more complex definition of adherence than any of the other studies. Non-adherence was defined as any of the following 1) increasing inhaled steroids outside of the plan 2) failure to increase inhaled steroids when indicated 3) prescription for prednisone by the physician when not indicated by the plan, 4) failure of the physician to prescribe prednisone when indicated, and 5) failure to complete diaries. Monthly diaries were assessed for adherence to the self-management plan. There was 65% adherence in the peak flow group and 52% adherence in the symptoms group. Change in therapy was appropriately implemented in 24/64 (37.5%) occasions in the peak flow group and 54/157 (34.3%) occasions in the symptom group.

PEAK FLOW BASED WRITTEN MANAGEMENT PLANS VERSUS NO WRITTEN MANAGEMENT PLANS

Cowie 1997 did not report data of adherence with regular treatment or adherence with the components of the written management plans.

Jones 1995 defined adherence only for the peak flow group. Adherence was defined as appropriately doubling their dose of inhaled steroid in response to an asthma episode. An asthma episode was defined as peak flow below 75% of predicted normal value when preceded by seven days of peak flow readings above 75% of predicted normal value. Of the 20 subjects who had episodes 9 were fully compliant and 3 complied during at least half of their episodes. Eight subjects never complied with the doubling of the dose of inhaled steroid in response to an asthma episode.

SYMPTOM BASED WRITTEN MANAGEMENT PLANS vs. NO WRITTEN MANAGEMENT PLANS

Cowie 1997 did not report data of adherence with regular treatment or adherence with the components of the written management plans.

SYMPTOM BASED OR PEAK FLOW BASED WRITTEN MANAGEMENT PLANS vs. NO WRITTEN MANAGEMENT PLANS

van der Palen 2001 defined adherence as taking 75% or more of the prescribed dose of inhaled steroid medication. This information was self-reported in a two-week diary at one year follow-up. A total of 94/105 (89.5%) of the written plan group and 98/108 (90.7%) of the no written plan group were adherent which was not statistically significant between groups.

SECONDARY OUTCOMES

The written management plans were either peak flow or symptom based, these were compared against each other or compared to no written management plan. There was little consistency between the studies in terms of reported outcomes. The outcomes discussed below are those that included two or more studies (but the MetaView plots show all available results). As there were insufficient number of included studies, we did not conduct any subgroups analysis.

PEAK FLOW BASED WRITTEN MANAGEMENT PLANS VERSUS SYMPTOM BASED WRITTEN MANAGEMENT PLANS

- **Unscheduled doctor visits (number of participants)**
Two studies with 207 participants provided data for this outcome (Charlton 1990; Turner 1998) which favoured symptom based management plans in reducing the number of patients who visited their doctors for treatment (RR 1.34; 95%CI 1.01 to 1.77). The number needed to treat (NNT) calculated from the risk difference for this outcome is 7 (95% CI 4 to 100). The very wide confidence interval of this estimate was noted. There was considerable heterogeneity between the two studies and when combined using a random effects model the pooled result was no longer significant (RR 1.58; 95% CI 0.23 to 10.85).

- **Hospitalisation (number of participants)**
Three trials with 283 participants (Cowie 1997; Turner 1998; López-Vina 2000) provided this data for this outcome, which was not significantly different between the two types of written management plans (RR 1.17; 95%CI 0.31 to 4.43).

- **Emergency Department visits (number of visits)**
Three trials (Cowie 1997; Turner 1998; López-Vina 2000) provided data on emergency department visits (RR 0.86, 95%CI 0.44 to 1.67). This outcome was also not significantly different when the two different types of written management plans were compared. There was significant heterogeneity in the overall result and the Cowie 1997 study was identified as the cause. The result from Cowie 1997 favoured peak flow plans whilst the other two studies (Turner 1998; López-Vina 2000) favoured symptom plans.

- **Oral corticosteroid courses (number of participants)**
Two studies with 198 participants provided data for this outcome (Charlton 1990; Turner 1998). The overall result contained significant heterogeneity as the two studies favoured one or the other type of written management plan.

- **Days lost from work/school (number of participants)**
Two studies with 192 participants provided this data (Turner 1998; López-Vina 2000) and they did not show any difference between the two types of written management plans.

PEAK FLOW BASED WRITTEN MANAGEMENT PLANS VERSUS NO WRITTEN MANAGEMENT PLANS

Outcomes reported included: hospitalisation, emergency department visits, FEV1% predicted, FVC% predicted and peak expiratory flow (PEF)% predicted, but none were reported by more than one study.

SYMPTOM BASED WRITTEN MANAGEMENT PLANS vs. NO WRITTEN MANAGEMENT PLANS

Outcomes reported included: hospitalisation, emergency department visits and adherence to treatment, but none were reported by more than one study.

SYMPTOM BASED OR PEAK FLOW BASED WRITTEN MANAGEMENT PLANS vs. NO WRITTEN MANAGEMENT PLANS

Outcomes reported included: FEV1 % predicted, morning peak flow, peak flow variability, PC20 histamine, but none were reported by more than one study.

DISCUSSION

This review shows that we do not understand what changes the patients are prepared, or able, to undertake after receiving a written individualised management plan for asthma. Data from the seven included studies are limited and cannot address the primary objective of this review which was a test of whether the provision of a written individualised management plan for asthma increases adherence to asthma management behaviours.

A typical written individualised management plan for asthma requires a number of separate component behaviours.

These include:

- (1) taking regular inhaled steroid medication
- (2) doubling the dose of inhaled steroid medication in response to a deterioration
- (3) taking oral medication and
- (4) seeking urgent medical aid in response to a further deterioration in either symptoms or peak flow.

This review attempted to assess whether the provision of a written individualised management plan increased adherence with any of these component behaviours. The studies identified used various

methods to measure adherence with these component behaviours but focused on the health outcomes associated with the provision of the plan. Unless measurements of the extent to which the component behaviours are undertaken it will be impossible to determine why a particular study may, or may not show, a difference between patients provided with a written individualised plan and those who are not.

Data provided by the studies included in this review were limited so no overall conclusions can be drawn regarding the benefits of written management plans in asthma. However, the conclusions from the six individual trials are discussed below.

Cowie 1997 concluded that although all three intervention groups (education, peak flow based plans, symptom based plans) experienced improvement in their asthma control there was a reduction in the emergency department visits for asthma in only the peak flow based plan group. No difference in emergency department visits was seen in the symptom based plan group or the control group who only had education. No measurement of adherence was reported in this study. It is not possible to relate changes in adherence to the outcomes reported.

Côté1997 concluded that there were no differences between the three study groups (no written plan plus no education, peak flow written plan plus education, symptom based written plan plus education) in terms of unscheduled doctor visits, hospitalisations, oral steroid requirement or days lost from work/school. Adherence was measured by covert canister weight in this study. Comparison of canister weight has shown that self-reported adherence is often an overestimate of medication use Rand 1994. Interestingly, adherence was significantly lower in the control group at baseline but that all three groups showed similar levels of adherence throughout the study. The proportion of prescribed doses taken was not reported in this study.

Jones 1995 concluded that there were no differences between the two study groups (no written plan plus regular surgery review, peak flow written plans plus regular surgery review) in terms of lung function, symptoms, quality of life and prescribing costs. Adherence was reported for the peak flow written plan group but not for the no-written plan group. Therefore, it is not possible to compare outcomes between groups with reference to the level of adherence.

Turner 1998 reported that, with both study groups (peak flow based written plans, symptom based written plans), there were significant improvements in FEV1, symptom score, decreased use of bronchodilators, increased use of steroids, PC20 methacholine and quality of life when compared to the pre-study (or baseline) values (within group difference) but there were no differences when the two groups were compared (between groups differences). In addition, in this study fewer patients in the peak flow based group made unscheduled doctor visits compared to the symptom based plan group. Adherence to the written management plans

was higher in the peak flow based group (65%) when compared to the symptom-based group (52%). Adherence was defined as a composite of behaviours where the subject controlled some and the doctor controlled some. From the available data it is not possible to extract the relative contribution of adherence to each of the component behaviours.

López-Vina 2000 reported that both study groups (peak flow based written plan plus education, education only) improved over the course of the 12-month study. The peak flow based written plan group showed a significant increase in improvement 83.4% versus 52.2% in the control group. Percent predicted FVC also significantly improved in the plan group 99.5% vs the control group 94.3%. Adherence was defined using a modified version of the Inhaler Adherence Scale. A limitation of using a self-report instrument such as the IAS is that participants who are included in an intervention might be more likely to report what they have been taught or asked to do. The increase in adherence by self-report in this study is in contrast with the findings of no change in adherence by covert canister weight reported in Côté1997.

Charlton 1990 concluded that there were no differences between the two study groups (peak flow based plan versus symptom based plan). Similar improvements were shown for doctor consultations and course of oral steroids between groups. Adherence was not measured in this study.

van der Palen 2001 demonstrated that subjects in the written plan group had a greater improvement in behavioural variables such as generalised self-efficacy and social support compared with the no plan group. Measures of lung function and airway hyper responsiveness were not different between groups (unpublished data). Adherence was defined as taking 75% or more of prescribed doses of inhaled steroid medication as recorded in self-report diary. There was no significant difference between groups in the proportion who were defined as adherent.

A number of the studies have failed to demonstrate any difference in health outcomes between written individualised plan groups and control groups. This failure to show a difference may be because the provision of a written individualised plan does not lead to any change in behaviour or that enrolment in a study leads to similar improvements between both the control group and the plan group. There appears to be some evidence for this, as suggested by the study by Côté2001, where the proportion of participants who had a prescription of inhaled steroids increased similarly between the control group, limited education group and the structured education group. Cowie 1997 also showed no difference between control groups, peak flow based plan and symptom based plan groups in terms of inhaled steroid and oral steroid use. This suggests that the failure of studies to show a benefit from the use of a written individualised management plan seems to be due to the increased use of regular inhaled steroids due to optimisation of treatment in both the plan and no plan groups. The other component behaviours of doubling inhaled steroids, commencing

oral steroids and urgent medical review did not appear to have occurred to a greater extent in the plan groups. Although written individualised plans recommend these additional component behaviours, it is not clear whether these were followed. Perhaps the reason for the relatively small improvements, if at all, shown by plan groups has been because the participants have not adhered to the other component behaviours specified in the written individualised management plan for asthma.

A previous review by Gibson 1998 has shown that self-management education, regular review and a written action plan leads to improved health outcomes for adults. However, this review included studies where the provision of a written individualised plan was only one part of the interventions used. When the comparison was restricted to studies that compared optimal self-management and doctor management of asthma there were few and only small differences. There were no significant differences in hospitalisations, emergency room visits, unscheduled doctor visits, nocturnal asthma and disrupted days. The only difference was shown in one study for days of work or school. The results from this review suggest that to change asthma management behaviour and improve health outcomes requires a coordinated approach of self-management education, regular review and a written action plan.

Due to the small number of included studies that contributed data for the current meta-analysis and the small number of patients recruited in the studies no overall picture emerges. In the studies where adherence was measured and reported a different method was used preventing meaningful between study comparisons. Although, the lack of improvement in health outcomes in the included studies did not demonstrate a significant effect, there are insufficient data available to determine whether written individualised management plans for asthma leads to an increase in adherence with asthma management behaviours.

AUTHORS' CONCLUSIONS

Implications for practice

Due to the paucity of evidence from trials, it is not possible to conclude whether use of written management plans (peak flow or symptom based plans) alone leads to an improvement in adherence with asthma management behaviours. Improvements in participant outcomes requires a comprehensive programme that includes education, a written self-management plan and regular review.

Implications for research

A number of studies have been undertaken to determine whether written individualised plans leads to improved health outcomes. These studies have been conducted without good measures of ad-

herence with asthma management behaviours. Of the seven included studies, two did not report adherence, three studies reported adherence with daily medication use and two studies reported adherence with instructions for deterioration in asthma control contained within the written management plan. No study reported both adherence with daily medication use and adherence with instructions for deterioration in asthma control contained within the written plan. The absence of reported adherence measures has limited our ability to determine what asthma management behaviours have been implemented or not implemented and those that led to the study outcomes.

All but one of the studies measured adherence using simple and convenient yet imprecise measure of self-reporting (Rand 1994). Many studies have compared electronic data with self-report and shown that self-report is likely to lead to an over estimation of actual medication use.

Future studies of asthma self-management using written individualised plans should measure adherence with each of the behaviours specified within the plan. Ideally, electronic monitoring of medication use should be used to provide the most reliable and accurate measure of adherence. Only when we have these data will we be able to target our educational programs at the components of asthma management that lead to the greatest improvement in health outcomes.

POTENTIAL CONFLICT OF INTEREST

There are no known conflicts of interest.

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*Indicates the major publication for the study

TABLES**Characteristics of included studies**

| Study | Charlton 1990 |
|------------------------|---|
| Methods | Randomised controlled trial with a parallel design, conducted in the UK in a nurse run asthma clinic in general practice. |
| Participants | 115 patients with asthma (46 children, 69 adults) undergoing prophylactic treatment for asthma and attending a nurse run asthma clinic. |
| Interventions | Patients were randomised to either a peak flow self management plan or a symptoms only self management plan. Duration of intervention: 12 months. |
| Outcomes | Number of doctor consultations, courses of oral steroids, and short term nebulised treatments. |
| Notes | |
| Allocation concealment | B – Unclear |

| Study | Cowie 1997 |
|------------------------|---|
| Methods | Randomised controlled trial with a parallel design, conducted in Canada in a tertiary hospital. |
| Participants | 150 patients with asthma (52 control, 50 symptom group, 48 peak flow group) were recruited after presenting at an emergency department or clinic for urgent treatment. Patients who previously had written action plans were excluded but those with peak flow meters were included. |
| Interventions | Patients were randomly allocated to receive either no action plan, an individualised symptom-based action plan or an individualised peak flow based written action plan. All patients received evaluation and education for their asthma before being randomised to one of the 3 study groups. Duration of intervention: 6 months. |
| Outcomes | ED attendance, hospitalisation, % predicted FEV1, night awakening, corticosteroid use (inhaled, oral), bronchodilator use. |
| Notes | Sealed envelopes were used for treatment allocation which previously generated random number sequence. |
| Allocation concealment | A – Adequate |

| Study | Côté 1997 |
|--------------|--|
| Methods | Randomised controlled trial with a parallel design, conducted in Canada in a tertiary hospital. |
| Participants | A total of 188 patients with moderate to severe asthma were recruited and 149 completed the study (54 control, 50 peak flow group, 45 symptom group, 39 dropouts). Patients who were current or ex-smokers and 40 yrs of age or older in who the best FEV1 after salbutamol was < 80% of predicted were excluded, as |

Characteristics of included studies (Continued)

| | |
|------------------------|---|
| | were those patients requiring > 7.5 mg/d of prednisone to control their asthma and those who had previously taken part in an asthma educational program. |
| Interventions | This was a one year before/ one year after study. In the first year optimisation of asthma therapy for all patients occurred. This followed by random allocation to one of the three study groups (control group with no formal education or action plan; education and peak flow written action plan group; education with symptom based written action plan). Duration of intervention: 12 months. |
| Outcomes | Hospitalisation, A&E visits, steroid use, days off work/school, knowledge, compliance. |
| Notes | |
| Allocation concealment | B – Unclear |

Study **Jones 1995**

| | |
|------------------------|--|
| Methods | Randomised controlled trial with a parallel design, conducted in the UK in 25 general practices. |
| Participants | Seventy two patients (33 in peak flow based written action plan group, 39 in control group who had scheduled visits) recruited from general practice clinics. All patients were given a 2 week course of oral prednisone (40mg/d) to optimise lung function, randomisation in blocks of six followed this 2 week optimisation treatment. In order to be eligible for recruitment into the study, patients could not exceed 1000ug in their daily dose of inhaled corticosteroid and they had to be using their inhaled steroids for minimum of one month before entry into the study. Also patients who were on regular oral steroids and those who already possessed a peak flow meter were excluded. |
| Interventions | Patients allocated to either written action plan based on peak flow monitoring with regular surgery review or surgery review only (controls). Duration of intervention: 6 months. |
| Outcomes | FEV1, FVC, PEF, symptoms (wheeze, shortness of breath, time of work/school, bronchodilator use, cough, wake at night, asthma restricting daily activity). |
| Notes | |
| Allocation concealment | B – Unclear |

Study **López-Vina 2000**

| | |
|------------------------|---|
| Methods | Randomised controlled trial with a parallel design, conducted in Spain. |
| Participants | 100 asthma patients (aged 17 to 65 years) who required treatment in the emergency departments of local acute-care hospitals over an 18-month period due to an episode of acute asthma exacerbation were recruited. Inclusion criteria: symptomatic disease during the previous year, satisfying the American Thoracic Society's definition of asthma, with symptoms of episodic wheezing, cough and shortness of breath responding to bronchodilators, and reversible airflow obstruction documented on at least one previous pulmonary function study. Reversibility was defined as a > 20% increase in the FEV1 or peak expiratory flow following inhalation of salbutamol (0.2 mg). In patients with normal spirometric data at the initial assessment (before randomisation) and lack of functional demonstration of asthma before their visit to the emergency department, a methacholine challenge test was required. The challenge was terminated when FEV1 fell by more than 20% from baseline value (PD20). Patients with concurrent chronic diseases that may affect the interpretation of results (COPD, emphysema, cystic fibrosis, severe rheumatoid arthritis, neoplasia etc.) were excluded. |
| Interventions | Patients were randomly allocated to either an experimental group (peak expiratory flow guided therapeutic plan with educational intervention) or a control group (symptoms only guided self management plan). |
| Outcomes | Days with symptoms, sleep disruptions, asthma attacks, absenteeism from school/work, visits to emergency ward, hospital admission, correct use of inhaler, FEV1 % predicted, FVC % predicted, adherence to treatment. |
| Notes | |
| Allocation concealment | B – Unclear |

| Study | Turner 1998 |
|------------------------|---|
| Methods | Randomised controlled trial with a parallel design, conducted in Canada in 25 primary care facilities. |
| Participants | Ninety two adult patients with asthma (44 peak flow group, 48 symptom group). Study only recruited patients with a baseline PC20 methacholine < 8mg/ml and those who had a daily requirement for inhaled corticosteroids to manage their symptoms. Study excluded patients who previously had a peak flow meter or those that could not use one. They also stratified all patients according to their severity of airway hyper-responsiveness using values of PC20 methacholine < 2mg/ml or > 2mg/ml, randomisation (using random number chart) followed this stratification. |
| Interventions | Patients were allocated to either written action plan based on peak flow monitoring or written plans based on asthma symptoms. Duration of intervention: 6 months. |
| Outcomes | hospitalisation, A&E visits, days lost from school/work, doctor visits, prednisone use, respiratory tract infections, beta 2 agonists use, FEV1, symptoms, quality of life. |
| Notes | Patients were randomised according to random number charts. |
| Allocation concealment | A – Adequate |

| Study | van der Palen 2001 |
|------------------------|--|
| Methods | Randomised controlled trial with a parallel design, conducted in the Netherlands. Subjects recruited from an outpatient database. |
| Participants | Two hundred and fifty adult patients with asthma (123 written plan group, 122 no written plan group). Study recruited patients who had stable asthma for the previous 6 weeks and who had been using inhaled steroids for at least the previous 3 months. Study excluded patients who had other serious internal disease or psychiatric morbidity. Also, patients excluded if their lung function didn't meet an unspecified criteria. |
| Interventions | All patients were given self-management training prior to randomisation. Patients were then allocated to either written self-management plan or no written self-management plan. Duration of intervention: 12 months |
| Outcomes | Adherence, Inhalation technique, Self-efficacy, Asthma specific knowledge, Lung function, Airway hyper-responsiveness. |
| Notes | Patients were randomised according to closed envelope method. |
| Allocation concealment | B – Unclear |

Characteristics of excluded studies

| Study | Reason for exclusion |
|--------------|---|
| Allen 1995 | Study on the effects of asthma education but no written management plans included. |
| Ayres 1996 | Study comparing budesonide dose regimen in combination with management plans. |
| Bailey 1987 | Not an RCT. |
| Bailey 1990 | No written management plans included in study. |
| Bailey 1999 | No written management plans included in study. |
| Baum 1986 | Intensive asthma education included with written management plans. |
| Berg 1995 | Study did not include written asthma instructions as part of the intervention program. Self management program used involved: behavioural changes, thoughts, self-monitoring, compliance, asthma information, education on pathophysiology, diagnosis, prevention and respiratory system, peer group discussions, problem solving but no written instructions on asthma management. |

| | |
|---------------------|---|
| Berg 1997 | Study did not include written asthma instructions as part of the intervention program. Self management program used involved: behavioural changes, thoughts, self-monitoring, compliance, asthma information, education on pathophysiology, diagnosis, prevention and respiratory system, peer group discussions, problem solving but no written instructions on asthma management. |
| Berg 1998 | Study did not include written asthma instructions as part of the intervention program. Self management program used involved: behavioural changes, thoughts, self-monitoring, compliance, asthma information, education on pathophysiology, diagnosis, prevention and respiratory system, peer group discussions, problem solving but no written instructions on asthma management. |
| Bheekie 2001 | Not an RCT patients were assigned alternately |
| Bolton 1991 | Education only no written management plans included in study. |
| Bonner 2002 | Composite intervention including education, daily coaching with medication which does not allow comparison of written plans only between groups |
| Brazil 1997 | Not an RCT |
| Brewin 1995 | Not a study of written management plans. |
| Cleland 2004 | Study looked at the impact training nurses had on asthma outcomes |
| Davis 2003 | Not an RCT but a review article |
| Espinosa 1998 | Intervention patients given personal education for a year. Likely to differ between groups on more than simply having a plan |
| Feifer 2004 | Not a RCT, but a case-control study, with a before and after design |
| Ford 1996 | Not an RCT |
| GRASSIC 1994 | Although written management plan were included in study the study had other major multiple interventions and the trial did not only test the effectiveness of written management plans. |
| Gallefoss 1999 | Intensive asthma educational intervention. |
| Garrett 1994 | Asthma education study and not all patients in the intervention group would get written management plans as they were advised to obtain one from their doctors. |
| Gebert 1998 | Intensive asthma education study, no mention of written asthma management plans. |
| Glasgow 2003 | Study does not specifically deal with the provision of written plans but has a composite intervention with may or may not include a written plan |
| Guevara 2003 | Not an RCT but a review article |
| Hilton 1986 | No written management plans included in study. |
| Ignacio-Garcia 1995 | Although written management plan were included in study the study had other major multiple interventions and the trial did not only test the effectiveness of written management plans. |
| Kardos 2001 | Comparison of fixed dose vs adjustable dosing the focus is not on the use of written individualised plans |
| Kauppinen 1999 | Study intervention for both the treatment and control groups were not similar as the treatment group were followed and reviewed much more regularly compared to the control group. |
| Kemple 2002 | Study looked at effective ways of prompting patients to turn up for asthma review |
| Kemple 2003 | Full text manuscript of abstract Kemple, 2002 |
| Kotses 1995 | No written management plans included in study. |
| Kotses 1996 | Although written management plan were included in study the study had other major multiple interventions and the trial did not only test the effectiveness of written management plans. |
| Lahdensuo 1996 | Although written management plan were included in study the study had other major multiple interventions and the trial did not only test the effectiveness of written management plans. |
| LeBaron 1985 | Not a study of written management plans. |
| Letz 2004 | Study compared PEFr based action plans versus symptom based plans no group without a plan |

Characteristics of excluded studies (Continued)

| | |
|---------------------|---|
| Lirsac 1991 | Study does not involve written management plans. |
| Maes 1988 | No written management plans included in study. |
| Mayo 1990 | No written management plans included in study. |
| Mulloy 1996 | Asthma education as the only intervention. |
| Neri 1996 | No written management plans included in study. |
| Shields 1986 | Study does not include written management plans. |
| Snyder 1987 | No written management plans involved in study. |
| Sommaruga 1995 | Although written management plan were included in study the study had other major multiple interventions and the trial did not only test the effectiveness of written management plans. |
| Thoonen 2002 | SM intervention group got 4 individual training session and intensive education more than the UC (usual care) control group |
| White 1989 | No written management plans included in study. |
| Wilson 1993 | Extensive educational study with no written management plans. |
| Wilson-Pessano 1987 | Not an RCT, but a proposal for a prospective study. |
| Windsor 1990 | No written management plans included in study. |
| Yoon 1993 | Although written management plan were included in study the study had other major multiple interventions and the trial did not only test the effectiveness of written management plans. |
| Zeiger 1991 | A study of comparison of asthma management by allergists versus generalists, there is no control (no intervention) group. |
| van der Palen 1997 | Not an RCT, before and after study on the same group of patients. |

ANALYSES

Comparison 01. Peak Flow based Written Plans (PFWP) versus No Written Plans (NWP)

| Outcome title | No. of studies | No. of participants | Statistical method | Effect size |
|---|----------------|---------------------|---|---------------------|
| 01 Hospitalisation (number of patients) | | | Relative Risk (Fixed) 95% CI | Totals not selected |
| 02 Emergency Department visits (number of patients) | | | Relative Risk (Fixed) 95% CI | Totals not selected |
| 03 FEV1 (% predicted) | | | Weighted Mean Difference (Fixed) 95% CI | Totals not selected |
| 04 FVC (% predicted) | | | Weighted Mean Difference (Fixed) 95% CI | Totals not selected |
| 05 PEFr (% predicted) | | | Weighted Mean Difference (Fixed) 95% CI | Totals not selected |

Comparison 02. Symptom based Written Plans (SWP) versus No Written Plans (NWP)

| Outcome title | No. of studies | No. of participants | Statistical method | Effect size |
|---|----------------|---------------------|------------------------------|---------------------|
| 01 Hospitalisation (number of patients) | | | Relative Risk (Fixed) 95% CI | Totals not selected |
| 02 Emergency Department visits (number of patients) | | | Relative Risk (Fixed) 95% CI | Totals not selected |

Comparison 03. Peak Flow based Written Plans (PFWP) versus Symptom based Written Plans (SWP)

| Outcome title | No. of studies | No. of participants | Statistical method | Effect size |
|---|----------------|---------------------|---|---------------------|
| 01 Adherence to treatment (number of patients) | | | Relative Risk (Fixed) 95% CI | Totals not selected |
| 02 Hospitalisations (number of hospitalisations) | | | Weighted Mean Difference (Fixed) 95% CI | Totals not selected |
| 03 Hospitalisation (number of patients) | 3 | 283 | Relative Risk (Fixed) 95% CI | 1.17 [0.31, 4.43] |
| 04 Emergency Department visits (number of visits) | | | Weighted Mean Difference (Fixed) 95% CI | Totals not selected |
| 05 Emergency Department visits (number of patients) | 3 | 283 | Relative Risk (Fixed) 95% CI | 0.86 [0.44, 1.67] |
| 06 Oral corticosteroid courses (number of courses) | | | Weighted Mean Difference (Fixed) 95% CI | Totals not selected |
| 07 Oral corticosteroid courses (number of patients) | 2 | 198 | Relative Risk (Fixed) 95% CI | 2.28 [1.25, 4.17] |
| 08 Days lost from work or school (number of days) | | | Weighted Mean Difference (Fixed) 95% CI | Totals not selected |
| 09 Days lost from work or school (number of patients) | 2 | 192 | Relative Risk (Fixed) 95% CI | 1.41 [0.62, 3.21] |
| 10 Unshedule doctor visits (number of patients) | 2 | 207 | Relative Risk (Fixed) 95% CI | 1.34 [1.01, 1.77] |
| 11 Respiratory Tract Infections (number of patients) | | | Relative Risk (Fixed) 95% CI | Totals not selected |
| 12 FEV1 (% predicted) | | | Weighted Mean Difference (Fixed) 95% CI | Totals not selected |
| 13 FVC (% predicted) | | | Weighted Mean Difference (Fixed) 95% CI | Totals not selected |

Comparison 04. Peak Flow or Symptom based Written Plans (PF-SWP) versus No Written Plan (NWP)

| Outcome title | No. of studies | No. of participants | Statistical method | Effect size |
|--|----------------|---------------------|---|---------------------|
| 01 Adherence to treatment (number of patients) | | | Relative Risk (Fixed) 95% CI | Totals not selected |
| 02 FEV1 (% predicted) | | | Weighted Mean Difference (Fixed) 95% CI | Totals not selected |
| 03 Morning PEF | | | Weighted Mean Difference (Fixed) 95% CI | Totals not selected |
| 04 PC20 Histamine (mg/ml) | | | Weighted Mean Difference (Fixed) 95% CI | Totals not selected |

INDEX TERMS

Medical Subject Headings (MeSH)

Asthma [*therapy]; Medical Records; Patient Compliance; Patient Education; Randomized Controlled Trials; Self Care [*methods]

MeSH check words

Adult; Child; Humans

COVER SHEET

Title Written individualised management plans for asthma in children and adults

Authors Toelle BG, Ram FSF

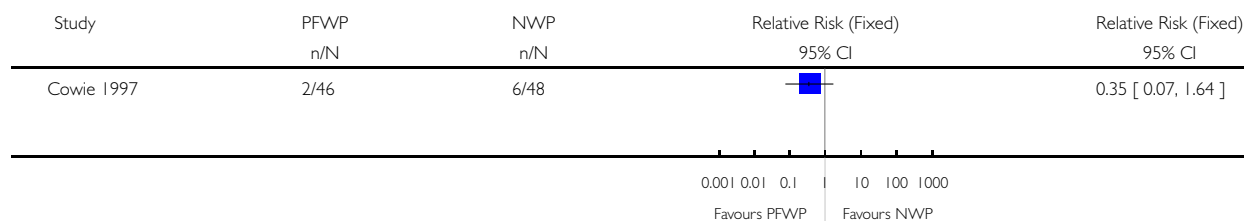
Written individualised management plans for asthma in children and adults (Review)
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| | |
|---|--|
| Contribution of author(s) | BT developed the original protocol. BT and FR conducted all aspects of the review from start to its completion. Both reviewers have approved of the final version. Review updated November 2003 by FR and BT. |
| Issue protocol first published | 2000/1 |
| Review first published | 2002/3 |
| Date of most recent amendment | 16 November 2004 |
| Date of most recent SUBSTANTIVE amendment | 10 October 2003 |
| What's New | <p>Updated September 2003: The latest search for trials identified 23 new studies of which three were obtained for full text review. This updated review includes one additional study (van der Palen 2001) and two excluded studies. The results and discussion section of this review have been revised by more detailed reporting of the primary outcome measure, adherence. However, the inclusion of the additional study has not altered the previously reported conclusions.</p> <p>Updated November 2004: The latest search conducted in June 2004 identified 30 new studies of which 12 were obtained for full text review. After full text review all studies were excluded.</p> |
| Date new studies sought but none found | Information not supplied by author |
| Date new studies found but not yet included/excluded | Information not supplied by author |
| Date new studies found and included/excluded | 01 June 2004 |
| Date authors' conclusions section amended | Information not supplied by author |
| Contact address | <p>Dr Brett Toelle Research Fellow Woolcock Institute of Medical Research Box M77 Missenden Road Post Office Camperdown New South Wales 2050 AUSTRALIA E-mail: bgt@woolcock.org.au Tel: +61 2 9515 8412 Fax: +61 2 9550 6115</p> |
| DOI | 10.1002/14651858.CD002171.pub2 |
| Cochrane Library number | CD002171 |
| Editorial group | Cochrane Airways Group |
| Editorial group code | HM-AIRWAYS |

GRAPHS AND OTHER TABLES

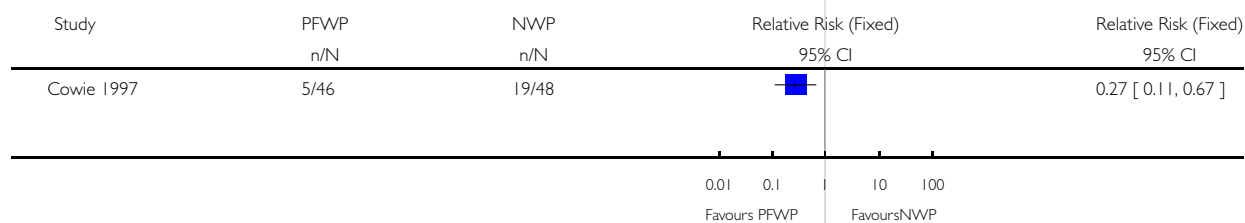
Analysis 01.01. Comparison 01 Peak Flow based Written Plans (PFWP) versus No Written Plans (NWP), Outcome 01 Hospitalisation (number of patients)

Review: Written individualised management plans for asthma in children and adults
 Comparison: 01 Peak Flow based Written Plans (PFWP) versus No Written Plans (NWP)
 Outcome: 01 Hospitalisation (number of patients)



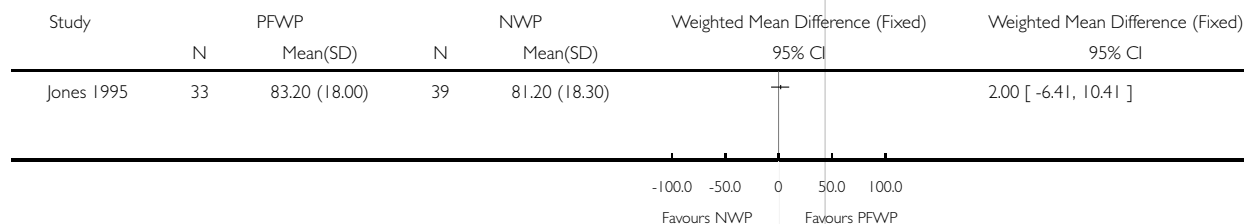
Analysis 01.02. Comparison 01 Peak Flow based Written Plans (PFWP) versus No Written Plans (NWP), Outcome 02 Emergency Department visits (number of patients)

Review: Written individualised management plans for asthma in children and adults
 Comparison: 01 Peak Flow based Written Plans (PFWP) versus No Written Plans (NWP)
 Outcome: 02 Emergency Department visits (number of patients)



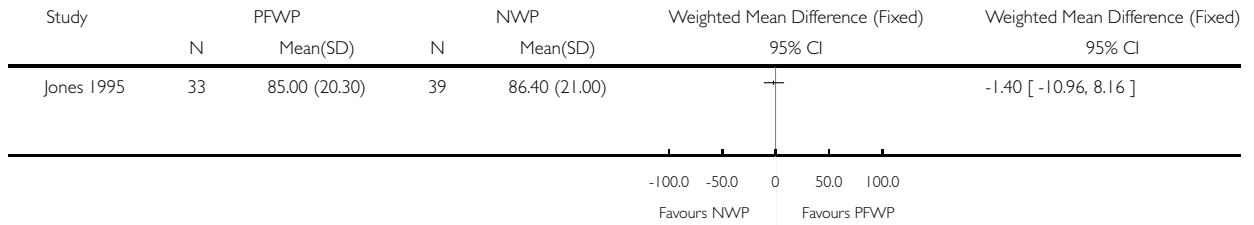
Analysis 01.03. Comparison 01 Peak Flow based Written Plans (PFWP) versus No Written Plans (NWP), Outcome 03 FEV1 (% predicted)

Review: Written individualised management plans for asthma in children and adults
 Comparison: 01 Peak Flow based Written Plans (PFWP) versus No Written Plans (NWP)
 Outcome: 03 FEV1 (% predicted)



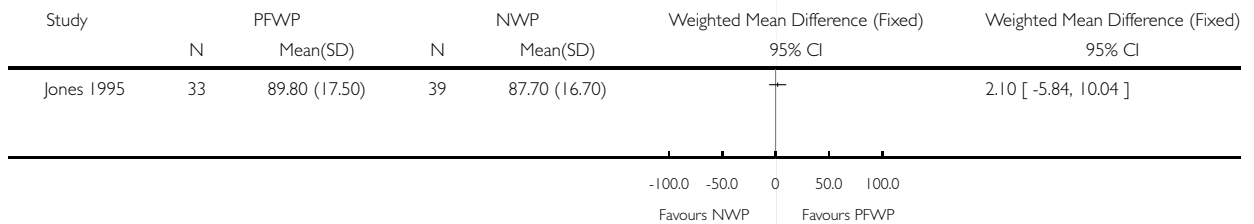
Analysis 01.04. Comparison 01 Peak Flow based Written Plans (PFWP) versus No Written Plans (NWP), Outcome 04 FVC (% predicted)

Review: Written individualised management plans for asthma in children and adults
 Comparison: 01 Peak Flow based Written Plans (PFWP) versus No Written Plans (NWP)
 Outcome: 04 FVC (% predicted)



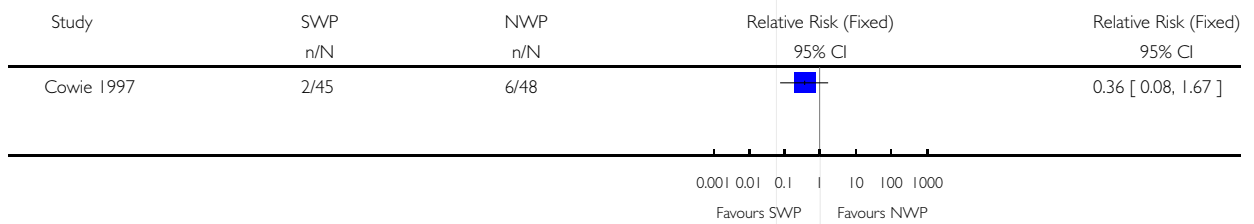
Analysis 01.05. Comparison 01 Peak Flow based Written Plans (PFWP) versus No Written Plans (NWP), Outcome 05 PEFR (% predicted)

Review: Written individualised management plans for asthma in children and adults
 Comparison: 01 Peak Flow based Written Plans (PFWP) versus No Written Plans (NWP)
 Outcome: 05 PEFR (% predicted)



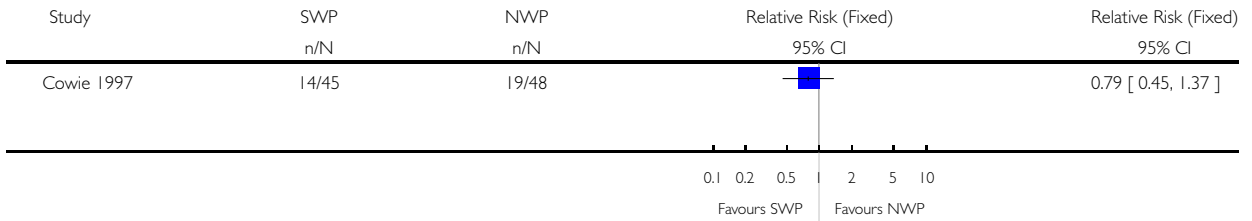
Analysis 02.01. Comparison 02 Symptom based Written Plans (SWP) versus No Written Plans (NWP), Outcome 01 Hospitalisation (number of patients)

Review: Written individualised management plans for asthma in children and adults
 Comparison: 02 Symptom based Written Plans (SWP) versus No Written Plans (NWP)
 Outcome: 01 Hospitalisation (number of patients)



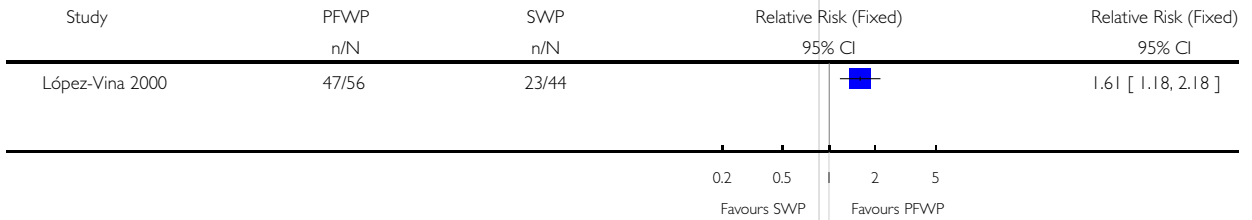
Analysis 02.02. Comparison 02 Symptom based Written Plans (SWP) versus No Written Plans (NWP), Outcome 02 Emergency Department visits (number of patients)

Review: Written individualised management plans for asthma in children and adults
 Comparison: 02 Symptom based Written Plans (SWP) versus No Written Plans (NWP)
 Outcome: 02 Emergency Department visits (number of patients)



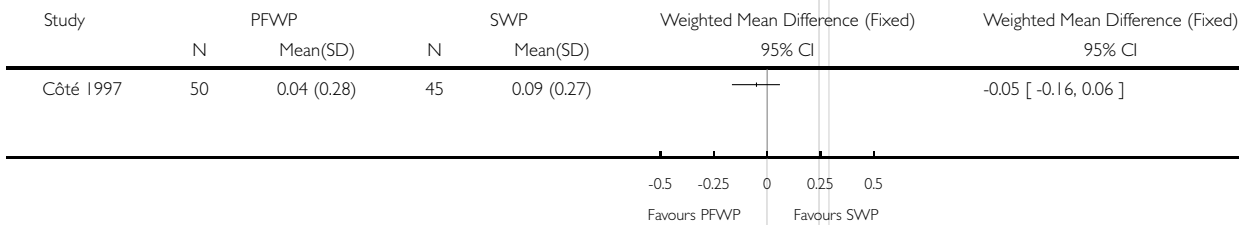
Analysis 03.01. Comparison 03 Peak Flow based Written Plans (PFWP) versus Symptom based Written Plans (SWP), Outcome 01 Adherence to treatment (number of patients)

Review: Written individualised management plans for asthma in children and adults
 Comparison: 03 Peak Flow based Written Plans (PFWP) versus Symptom based Written Plans (SWP)
 Outcome: 01 Adherence to treatment (number of patients)



Analysis 03.02. Comparison 03 Peak Flow based Written Plans (PFWP) versus Symptom based Written Plans (SWP), Outcome 02 Hospitalisations (number of hospitalisations)

Review: Written individualised management plans for asthma in children and adults
 Comparison: 03 Peak Flow based Written Plans (PFWP) versus Symptom based Written Plans (SWP)
 Outcome: 02 Hospitalisations (number of hospitalisations)

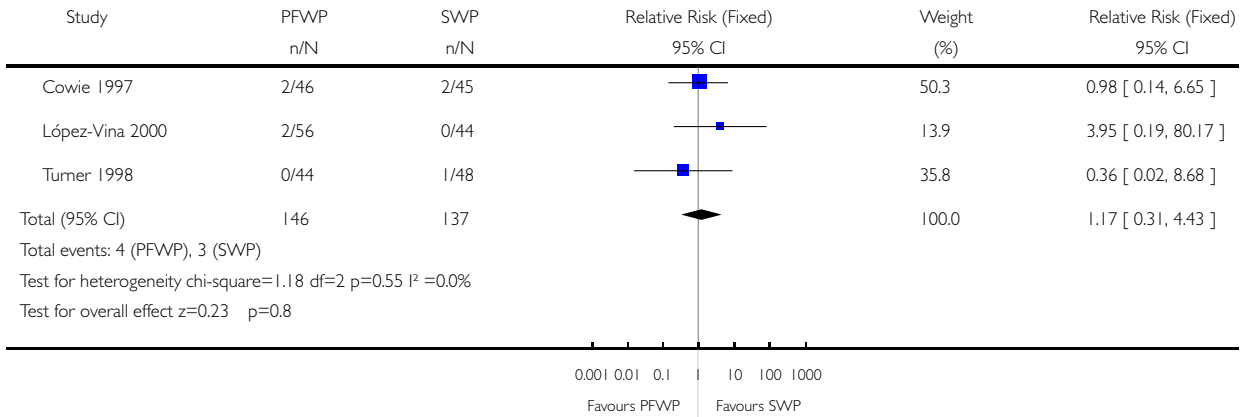


Analysis 03.03. Comparison 03 Peak Flow based Written Plans (PFWP) versus Symptom based Written Plans (SWP), Outcome 03 Hospitalisation (number of patients)

Review: Written individualised management plans for asthma in children and adults

Comparison: 03 Peak Flow based Written Plans (PFWP) versus Symptom based Written Plans (SWP)

Outcome: 03 Hospitalisation (number of patients)

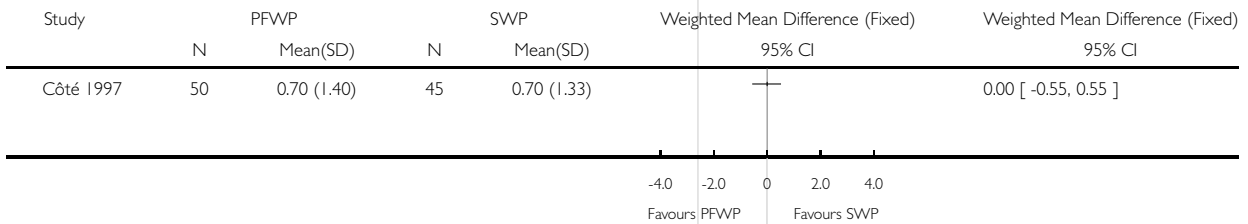


Analysis 03.04. Comparison 03 Peak Flow based Written Plans (PFWP) versus Symptom based Written Plans (SWP), Outcome 04 Emergency Department visits (number of visits)

Review: Written individualised management plans for asthma in children and adults

Comparison: 03 Peak Flow based Written Plans (PFWP) versus Symptom based Written Plans (SWP)

Outcome: 04 Emergency Department visits (number of visits)

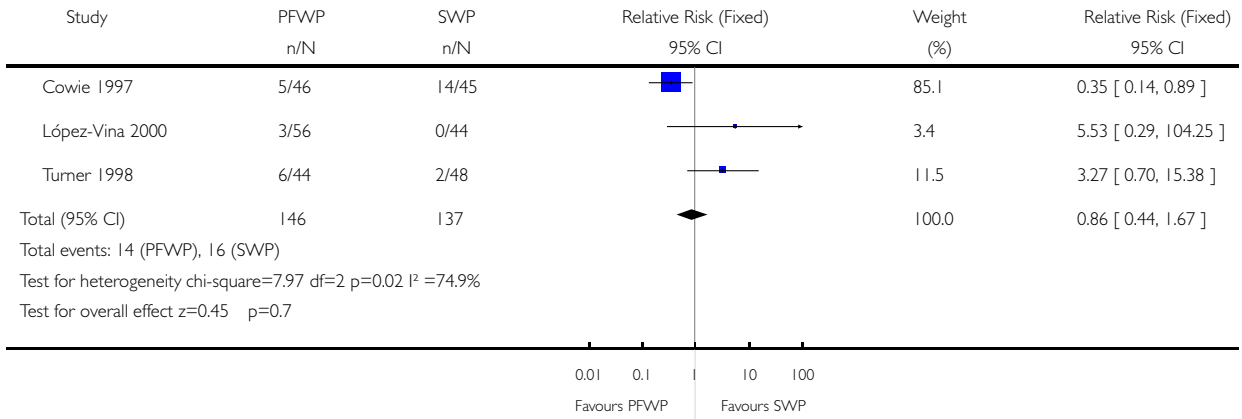


Analysis 03.05. Comparison 03 Peak Flow based Written Plans (PFWP) versus Symptom based Written Plans (SWP), Outcome 05 Emergency Department visits (number of patients)

Review: Written individualised management plans for asthma in children and adults

Comparison: 03 Peak Flow based Written Plans (PFWP) versus Symptom based Written Plans (SWP)

Outcome: 05 Emergency Department visits (number of patients)

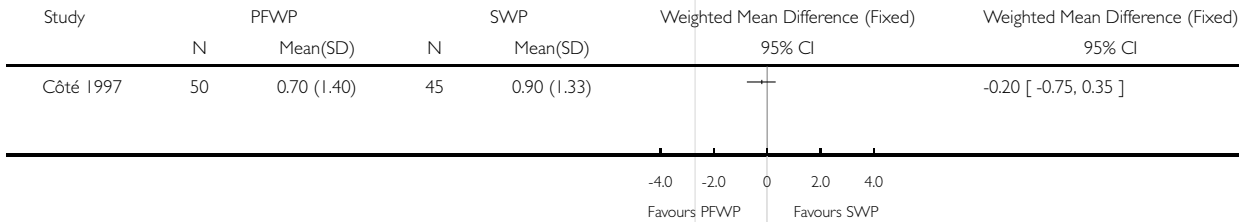


Analysis 03.06. Comparison 03 Peak Flow based Written Plans (PFWP) versus Symptom based Written Plans (SWP), Outcome 06 Oral corticosteroid courses (number of courses)

Review: Written individualised management plans for asthma in children and adults

Comparison: 03 Peak Flow based Written Plans (PFWP) versus Symptom based Written Plans (SWP)

Outcome: 06 Oral corticosteroid courses (number of courses)

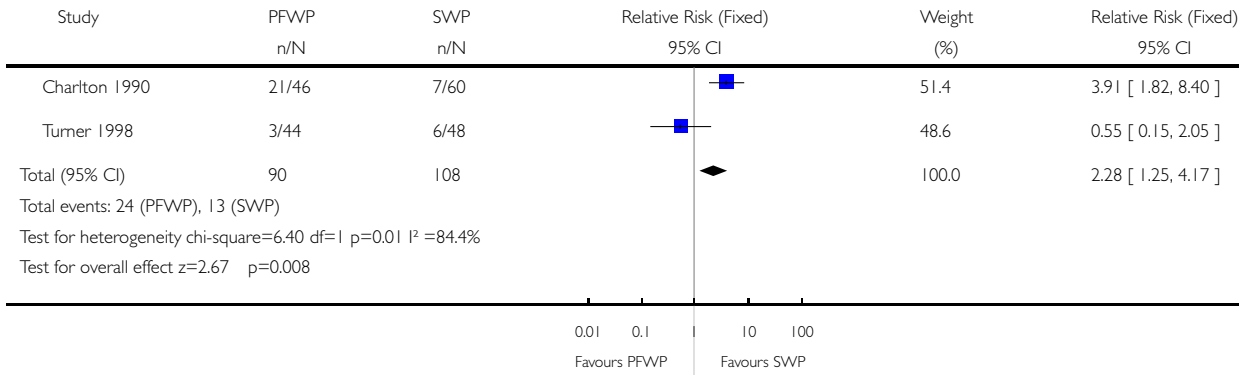


Analysis 03.07. Comparison 03 Peak Flow based Written Plans (PFWP) versus Symptom based Written Plans (SWP), Outcome 07 Oral corticosteroid courses (number of patients)

Review: Written individualised management plans for asthma in children and adults

Comparison: 03 Peak Flow based Written Plans (PFWP) versus Symptom based Written Plans (SWP)

Outcome: 07 Oral corticosteroid courses (number of patients)

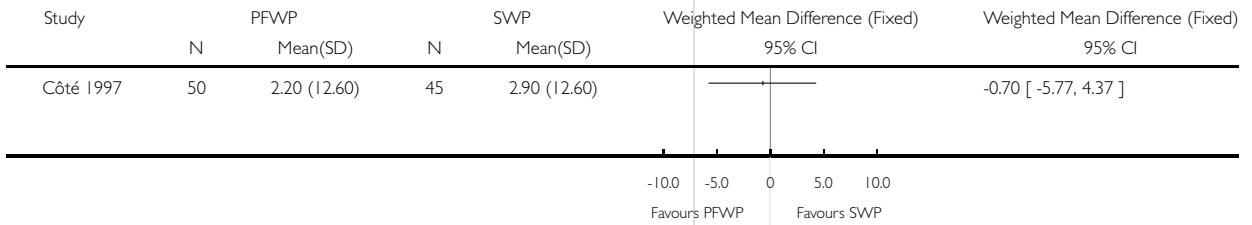


Analysis 03.08. Comparison 03 Peak Flow based Written Plans (PFWP) versus Symptom based Written Plans (SWP), Outcome 08 Days lost from work or school (number of days)

Review: Written individualised management plans for asthma in children and adults

Comparison: 03 Peak Flow based Written Plans (PFWP) versus Symptom based Written Plans (SWP)

Outcome: 08 Days lost from work or school (number of days)

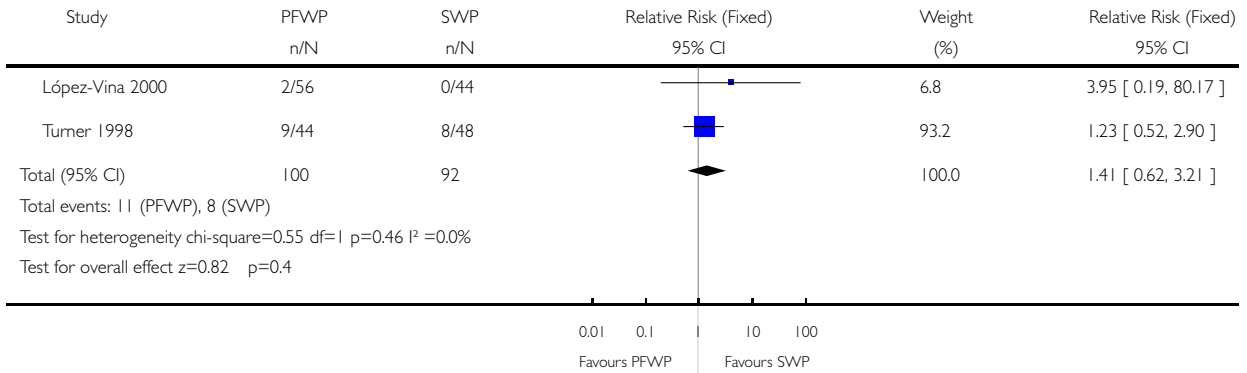


Analysis 03.09. Comparison 03 Peak Flow based Written Plans (PFWP) versus Symptom based Written Plans (SWP), Outcome 09 Days lost from work or school (number of patients)

Review: Written individualised management plans for asthma in children and adults

Comparison: 03 Peak Flow based Written Plans (PFWP) versus Symptom based Written Plans (SWP)

Outcome: 09 Days lost from work or school (number of patients)

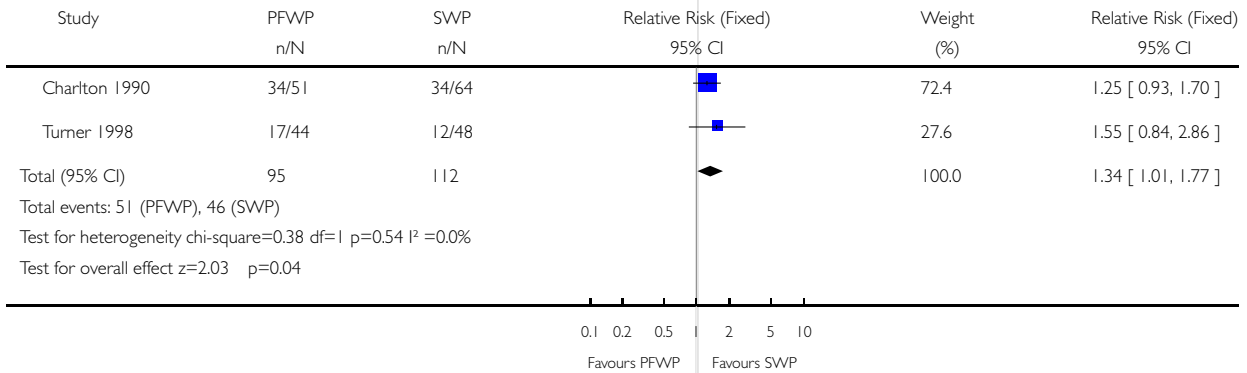


Analysis 03.10. Comparison 03 Peak Flow based Written Plans (PFWP) versus Symptom based Written Plans (SWP), Outcome 10 Unshedule doctor visits (number of patients)

Review: Written individualised management plans for asthma in children and adults

Comparison: 03 Peak Flow based Written Plans (PFWP) versus Symptom based Written Plans (SWP)

Outcome: 10 Unshedule doctor visits (number of patients)

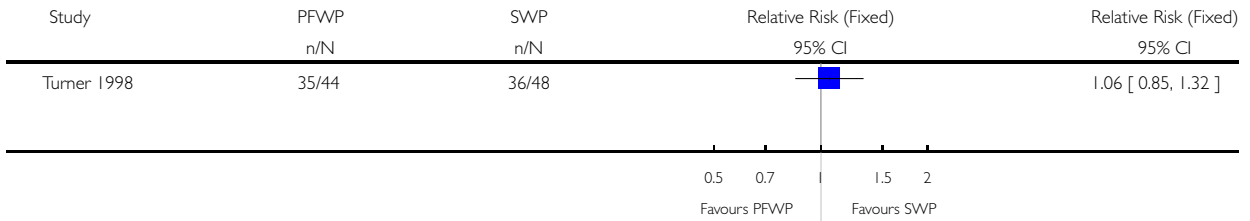


Analysis 03.11. Comparison 03 Peak Flow based Written Plans (PFWP) versus Symptom based Written Plans (SWP), Outcome 11 Respiratory Tract Infections (number of patients)

Review: Written individualised management plans for asthma in children and adults

Comparison: 03 Peak Flow based Written Plans (PFWP) versus Symptom based Written Plans (SWP)

Outcome: 11 Respiratory Tract Infections (number of patients)

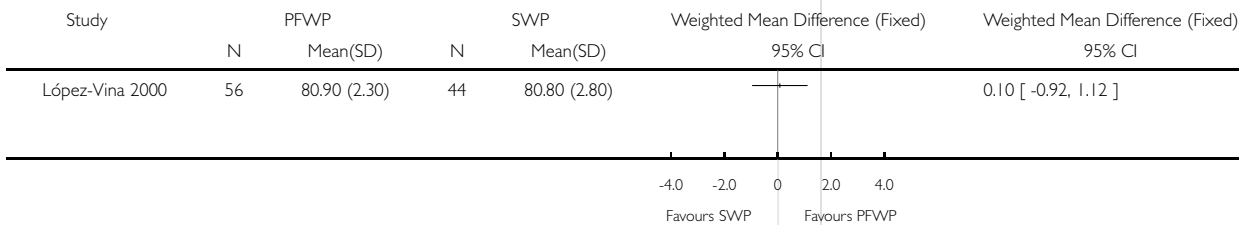


Analysis 03.12. Comparison 03 Peak Flow based Written Plans (PFWP) versus Symptom based Written Plans (SWP), Outcome 12 FEV1 (% predicted)

Review: Written individualised management plans for asthma in children and adults

Comparison: 03 Peak Flow based Written Plans (PFWP) versus Symptom based Written Plans (SWP)

Outcome: 12 FEV1 (% predicted)

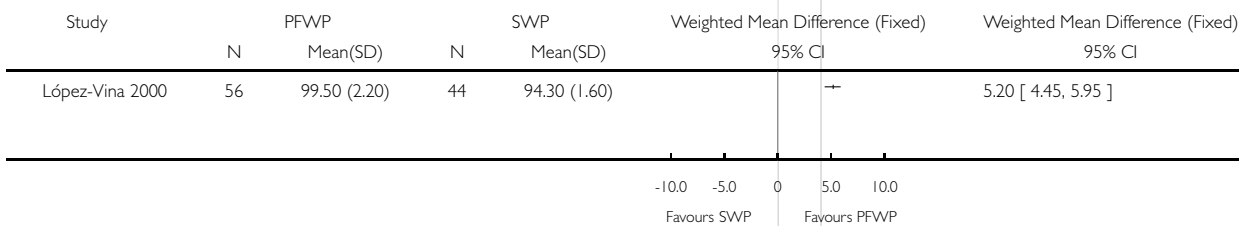


Analysis 03.13. Comparison 03 Peak Flow based Written Plans (PFWP) versus Symptom based Written Plans (SWP), Outcome 13 FVC (% predicted)

Review: Written individualised management plans for asthma in children and adults

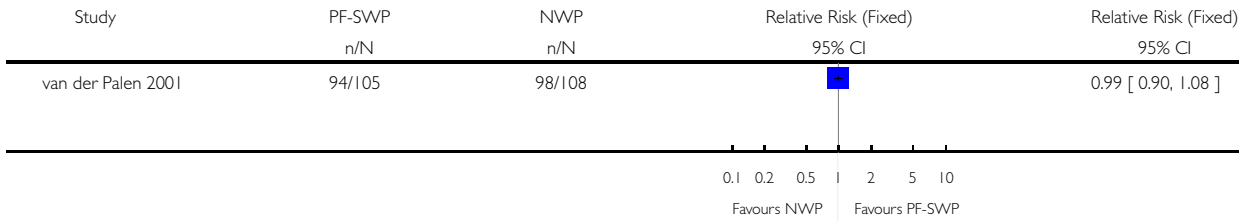
Comparison: 03 Peak Flow based Written Plans (PFWP) versus Symptom based Written Plans (SWP)

Outcome: 13 FVC (% predicted)



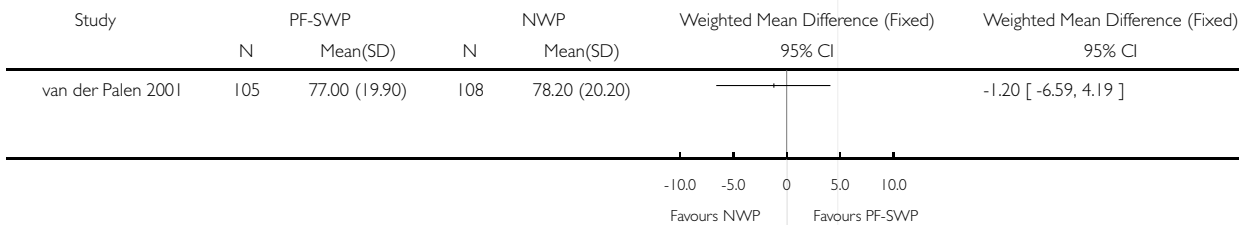
Analysis 04.01. Comparison 04 Peak Flow or Symptom based Written Plans (PF-SWP) versus No Written Plan (NWP), Outcome 01 Adherence to treatment (number of patients)

Review: Written individualised management plans for asthma in children and adults
 Comparison: 04 Peak Flow or Symptom based Written Plans (PF-SWP) versus No Written Plan (NWP)
 Outcome: 01 Adherence to treatment (number of patients)



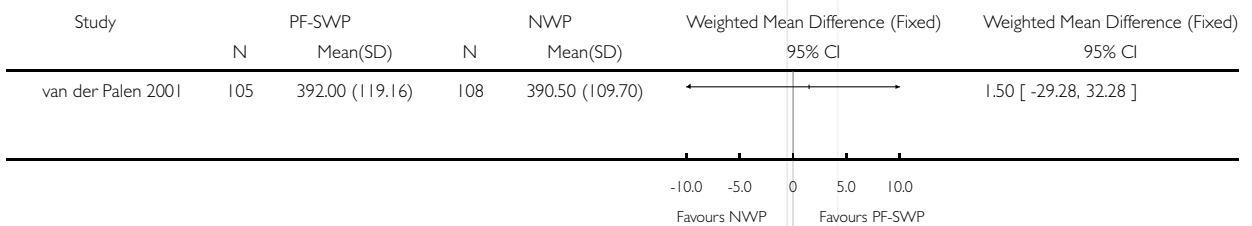
Analysis 04.02. Comparison 04 Peak Flow or Symptom based Written Plans (PF-SWP) versus No Written Plan (NWP), Outcome 02 FEV1 (% predicted)

Review: Written individualised management plans for asthma in children and adults
 Comparison: 04 Peak Flow or Symptom based Written Plans (PF-SWP) versus No Written Plan (NWP)
 Outcome: 02 FEV1 (% predicted)



Analysis 04.03. Comparison 04 Peak Flow or Symptom based Written Plans (PF-SWP) versus No Written Plan (NWP), Outcome 03 Morning PEF

Review: Written individualised management plans for asthma in children and adults
 Comparison: 04 Peak Flow or Symptom based Written Plans (PF-SWP) versus No Written Plan (NWP)
 Outcome: 03 Morning PEF



Analysis 04.04. Comparison 04 Peak Flow or Symptom based Written Plans (PF-SWP) versus No Written Plan (NWP), Outcome 04 PC20 Histamine (mg/ml)

Review: Written individualised management plans for asthma in children and adults

Comparison: 04 Peak Flow or Symptom based Written Plans (PF-SWP) versus No Written Plan (NWP)

Outcome: 04 PC20 Histamine (mg/ml)

