Interventions used to improve control of blood pressure in patients with hypertension (Review)

Fahey T, Schroeder K, Ebrahim S

THE COCHRANE COLLABORATION®

WILEY

TABLE OF CONTENTS

Interventions used to improve control of blood pressure in patients with hypertension (Review)

Fahey T, Schroeder K, Ebrahim S

ABSTRACT

Background

It is well recognized that patients with high blood pressure (hypertension) in the community frequently fail to meet treatment goals- a condition labeled as "uncontrolled" hypertension. The optimal way in which to organize and deliver care to patients who have hypertension so that they reach treatment goals has not been clearly identified.

Objectives

To determine the effectiveness of interventions to improve control of blood pressure in patients with elevated blood pressure.
To evaluate the ability of reminders to improve the follow-up of patients with elevated blood pressure.

Search strategy

All-language search of all articles (any year) in the Cochrane Controlled Trials Register (CCTR), Medline and Embase from June 2000.

Selection criteria

Randomised controlled trials (RCTs) of patients with hypertension that evaluated the following interventions:
(1) self-monitoring
(2) educational interventions directed to the patient
(3) educational interventions directed to the health professional
(4) health professional (nurse or pharmacist) led care
(5) organisational interventions that aimed to improve the delivery of care
(6) appointment reminder systems

Outcomes assessed were:
(1) mean systolic and diastolic blood pressure
(2) control of blood pressure
(3) proportion of patients followed up at clinic

Data collection and analysis

Two authors extracted data independently and in duplicate and assessed each study according to the criteria outlined by the Cochrane Collaboration Handbook.

Main results

59 RCTs met our inclusion criteria. The methodological quality of included studies was variable. An organized system of regular review linked to vigorous antihypertensive drug therapy was shown to reduce blood pressure (weighted mean difference -8.2/-4.2 mmHg, -11.7/-6.5 mmHg, -10.6/-7.6 mmHg for 3 strata of entry blood pressure) and all-cause mortality at five years follow-up (6.38% versus 7.78%, difference 1.4%) in a single large RCT- the Hypertension Detection and Follow-Up study. Other interventions had variable effects. Self-monitoring was associated with moderate net reduction in diastolic blood pressure (weighted mean difference (WMD): -2.03 mmHg, 95%CI: -2.69 to -1.38 mmHg, respectively. Appointment reminders increased the proportion of individuals

who attended for follow-up. RCTs of educational interventions directed at patients or health professionals were heterogeneous but appeared unlikely to be associated with large net reductions in blood pressure by themselves. Health professional (nurse or pharmacist) led care may be a promising way of delivering care, with the majority of RCTs being associated with improved blood pressure control, but requires further evaluation.

Authors' conclusions

Family practices and community-based clinics need to have an organized system of regular follow-up and review of their hypertensive patients. Antihypertensive drug therapy should be implemented by means of a systematic stepped care approach when patients do not reach target blood pressure levels.

PLAIN LANGUAGE SUMMARY

There is a lack of evidence about how care for hypertensive patients should be organized and delivered in the community to improve blood pressure control. This review was aimed to determine the effectiveness of interventions whose objective was to improve follow-up and control of blood pressure in patients taking blood pressure lowering drugs. We included studies that had as populations of interest adult patients with primary elevations of blood pressure in an ambulatory setting. The interventions included all those that aimed to improve blood pressure control. The outcomes assessed were mean systolic and diastolic blood pressure, control of blood pressure and the proportion of patients followed up at clinic.

Fifty nine randomised controlled trials met our inclusion criteria. The range of interventions used included (1) self-monitoring, (2) educational interventions directed to the patient, (3) educational interventions directed to the health professional, (4) health professional (nurse or pharmacist) led care, (5) organizational interventions that aimed to improve the delivery of care, (6) appointment reminder systems. The trials were very different in methodological quality, part of which was due to poor reporting. An organized system of regular review linked to vigorous antihypertensive drug therapy was shown to reduce blood pressure and all-cause mortality in a single large RCT- the Hypertension Detection and Follow-Up study. Other interventions had variable effects. Self-monitoring was associated with moderate net reductions in diastolic blood pressure (weighted mean difference (WMD): -2.03 mmHg, 95% confidence interval (CI): -2.69 to -1.38 mmHg. Appointment reminders increased the proportion of individuals who attended for follow-up (absolute difference 16%, but this pooled result should be treated with caution because of the heterogeneous results from individual RCTs). Trials of educational interventions directed at patients or health professionals were heterogeneous but appeared unlikely to be associated with large net reductions in blood pressure by themselves. Health professional (nurse or pharmacist) led care appears to be a promising way of delivering care but requires further evaluation.

We conclude that an organized system of registration, recall and regular review linked to a vigorous stepped care approach to antihypertensive drug treatment appears the most likely way to improve the control of elevated blood pressure. Health professional (nurse or pharmacist) led care requires further evaluation. Education alone, either to health professionals or patients, does not appear to be associated with large net reductions in blood pressure.

BACKGROUND

Elevated blood pressure (hypertension) is an important public health problem. Evidence from randomised trials has shown that effective drug treatment reduces the risk of cardiovascular morbidity and mortality (Collins 1994; Gueyffier 1999). However, there is ongoing concern that the regimens used in randomised trials of antihypertensive drug treatment are not implemented in everyday clinical practice (Burnier 2002). Community-based studies throughout the world show that blood pressure goals are achieved in only 25-40% of the patients who take antihypertensive drug treatment (Burnier 2002; Hyman 2001; Chobanian 2001; Smith 1990), a situation that has remained unchanged for the last 30 years (Wilber 1972).

The quality of care patients with hypertension receive from health professionals has a clear impact on their risk of suffering a cardiovascular event. Observational studies in the UK have shown that inadequate control of blood pressure is associated with a significant risk of stroke (Du 1997; Payne 1993). In terms of the process of care that hypertensive patients receive, characteristics of both the patient, health professional and the healthcare system have been implicated in poor blood pressure control. Lack of adherence to medication and not having a primary care physician were associated with poor blood pressure control in a US study (Shea 1992). More recent studies have shown that frequent contact with health care professionals does not guarantee better blood pressure

control unless there is a systematic use of antihypertensive drugs (Hyman 2001; Berlowitz 1998), and that individual practitioners vary substantially in their clinical performance when managing hypertension in the community (Frijling 2001). These observations have led some commentators to suggest that poor control of blood pressure in the community may be due to ineffective management and inadequate practice organisation, described jointly as "clinical inertia" (Phillips 2001).

Whilst there is a strong evidence-base for the benefits of antihypertensive drug therapy (Collins 1994; Blood 2000; Staessen 2001), there is little clear evidence as to how care for hypertensive patients should be organized and delivered in the community to help improve blood pressure control. This systematic review aims to update and build upon a previous review (Ebrahim 1998), to summarize the evidence from randomised controlled trials that evaluate different models of care that have been used to improve the control and follow-up of patients with hypertension.

OBJECTIVES

The objectives of this review are to:

(1) Evaluate which models of care are effective in improving "control" of high blood pressure;

(2) Evaluate the effectiveness of reminders on improving the follow-up of patients with hypertension.

CRITERIA FOR CONSIDERING STUDIES FOR THIS REVIEW

Types of studies

Randomised trials of interventions that have sought to evaluate different models of care for patients with hypertension with the overall aim of improving blood pressure control or follow-up care of patients. Included studies had to be RCTs with a contemporaneous control group where patient care in the intervention group(s) was compared with either no intervention or usual care. We excluded studies using interventions not intended to improve blood pressure control by organisational means, particularly drug trials and trials of non-pharmacological treatment.

Types of participants

The population of interest was composed of adult patients (aged 18 years or over) with primary hypertension (treated or not currently treated with blood pressure lowering drugs) in a primary care, outpatient or community setting.

Types of intervention

The interventions were aimed at improving control of blood pressure or clinic attendance and were classified as:

(1) self-monitoring
(2) educational interventions directed to the patient
(3) educational interventions directed to the health professional
(4) health professional (nurse or pharmacist) led care
(5) organisational interventions that aimed to improve the delivery of care
(6) appointment reminder systems

Types of outcome measures

Studies were included if they reported:
(1) mean systolic blood pressure (mean SBP) and/or mean diastolic blood pressure (mean DBP)
(2) control of blood pressure (blood pressure threshold that determines "control" being pre-specified or defined by each randomised trial's investigators)
(3) proportion of patients followed-up at clinic

SEARCH METHODS FOR IDENTIFICATION OF STUDIES

See: Hypertension Group methods used in reviews.

We identified original RCTs by an all-language search of all articles in the Cochrane Central Register of Controlled Trials (CENTRAL), from The Cochrane Library issue 3, 2002; from MEDLINE January 2000 to November 2002; and EMBASE January 2000 to November 2002. We screened the references of all retrieved articles to identify additional publications and contacted experts in the field about other relevant trials or unpublished material.

We used the following search strategy:

1. exp HYPERTENSION/
2. exp Antihypertensive Agents/
3. (blood adj pressure).ti.
4. hypertens$.tw.
5. or/1-4
6. exp PHYSICN/
7. exp Patient Care Management/
8. exp Patient Care Planning/
9. exp Patient Care Team/
10. exp Patient Education/
11. exp Patient Participation/
12. exp Ambulatory Care Information Systems/
13. exp FEEDBACK/
14. exp Information Systems/
15. exp Management Information Systems/
16. exp Decision Support Systems, Clinical/
17. exp Decision Making, Computer-Assisted/
18. exp Reminder Systems/
19. exp Practice Guidelines/
20. exp GUIDELINES/
21. exp Medical Audit/

22. exp Medical Records/
23. exp "Outcome and Process Assessment (Health Care)/
24. exp Medical Records Systems, Computerized/
25. exp Primary Health Care/
26. exp Physicians, Family/
27. exp Primary Nursing Care/
28. exp Nurse Practitioners/
29. exp Nurse Clinicians/
30. exp Health Behavior/
31. remind$.tw.
32. motiv$.tw.
33. Patient Care/
34. Nursing Care/
35. Guideline Adherence/
36. Ambulatory Care/
37. exp Behavior Therapy/
38. Counseling/
39. counsel$.tw.
40. Motivation/
41. self monitor$.tw.
42. ((patient$ or program$) adj3 (educat$ or manage$ or train$ or teach$)).tw.
43. self manage$.tw.
44. ((manage$ or monitor$) adj3 (hypertension or blood pressure)).tw.
45. Health Promotion/
46. exp Health Education/
47. (reward$ or incentivtte$)
48. uncontrol$.tw.
49. Self Care/
50. or/6-49
51. 5 and 50
52. randomized controlled trial.pt.
53. controlled clinical trial.pt.
54. Randomized Controlled Trials/
55. random allocation/
56. double blind method/
57. single blind method/
58. or/52-57
59. animal/ not human/
60. 58 not 59
61. clinical trial.pt.
62. exp clinical trials/
63. (clin$ adj25 trial$).ti,ab.
64. ((singl$ or doubl$ or treble$ or tripl$) adj25 (blind$ or mask$)).ti,ab.
65. placebos/
66. "placebo$.ti,ab.
67. "random$.ti,
68. research design/
69. or/61-68
70. 69 not 59
71. comparative study/

72. exp evaluation studies/
73. follow-up studies/
74. prospective studies/
75. (control$ or prospectiv$ or volunteer$).ti,ab.
76. or/71-75
77. 76 not 59
78. 60 or 70 or 77
79. 51 and 78
80. 60 or 70
81. 51 and 80
82. limit 81 to yr=2000-2002

Search strategy slightly amended for searching Cochrane Central Register of Controlled Trials (CENTRAL) and EMBASE.

METHODS OF THE REVIEW

Two of the authors assessed lists of citations and abstracts independently. We were not masked with regard to authors or journal. Each reviewer indicated whether a citation was potentially relevant (i.e. appearing to meet the inclusion criteria), was clearly not relevant, or gave insufficient information to make a judgement. To be included a study had to meet all the inclusion criteria. We resolved differences by discussion and obtained reprints of all potentially relevant citations.

We (TF and either KS or SE) independently extracted data in duplicate on study design, methods, clinicians and patients, interventions, outcomes and potential sources of bias using a structured data collection form. We wrote to the corresponding authors of studies to request missing data, clarify study details and enquire about unpublished studies.

Quality assessment
For assessment of study quality we collected data on randomization procedure, allocation concealment, blinding of participants, providers of care, outcome assessors and losses to follow-up (Clarke 2000).

We examined the effects on blood pressure between interventions at follow-up (systolic and diastolic blood pressure) according to the six pre-defined intervention categories. We compared and pooled the mean blood pressure differences from baseline to final follow-up in the intervention and control groups using the weighted mean difference approach (see Cochrane Collaboration: http://www.epi.bris.ac.uk/cochrane/stats3.html). When only partial information about the variance was provided in RCT reports, we calculated variances using the method described by Follman (Follman 1992). We have taken account of the correlation of baseline and final blood pressure measurements by using empirical data from the Caerphilly dataset which examined the correlation between baseline and 5-year follow-up blood pressure measurements in 2000 men (r=0.568 for systolic and r=0.514 for diastolic blood pressure) (personal communication

Margaret May, Department of Social Medicine, University of Bristol).

For blood pressure control and clinic attendance at follow-up statistical and clinical significance was evaluated by means of estimating odds ratios with 95% confidence intervals. Individual study definitions of control of blood pressure and attendance at clinic were used. For both continuous and categorical outcomes, we checked the meta-analyses for heterogeneity by visual inspection and by Cochran's test. When heterogeneity is significant, the individual study results are presented to illustrate the magnitude of blood pressure reduction reported but no overall pooled results are presented. Pooled odds ratios and their 95% confidence intervals were calculated with The Cochrane Collaboration RevMan 4.1 software.

DESCRIPTION OF STUDIES

Fifty nine randomized controlled trials met the inclusion criteria. Three randomised controlled trials had a factorial design and are included twice under separate intervention headings- Pierce (self-monitoring and education- patient) (Pierce 1984), Sackett (education- patient and organisation of care) (Sackett 1975), and Dickinson (education- health professional and organisation of care) (Dickinson 1981).

METHODOLOGICAL QUALITY

The reported methodological quality of included studies was generally poor to moderate. Nineteen randomised controlled trials (32%) stated the randomization process, whilst only six (10%) had adequate allocation concealment. In 11 studies (19%) the outcome assessors were blind to the treatment allocation. Losses to follow-up of greater than 20% or more occurred in 12 (20%) of studies.

For a detailed summary of each of the 59 included RCTs see Table 01.

RESULTS

(1) Self-monitoring (n=15 RCTs) (Pierce 1984; Bailey 1998; Carnahan 1975; Friedman 1996; Haynes 1976; Johnson 1978; Mehos 2000; Rogers 2001; Soghikian 1992; Vetter 2000; Zarnke 1997; Artinian 2001; Midanik 1991; Rudd 2004; Earp 1982).
In the ten RCTs that reported on differences in mean SBP (Carnahan 1975; Soghikian 1992; Friedman 1996; Bailey 1998; Mehos 2000; Vetter 2000; Rogers 2001; Artinian 2001; Midanik 1991; Rudd 2004), self-monitoring was associated with significant between-group heterogeneity (range -26 to +5 mmHg). Pooled data from twelve RCTs on difference of mean DBP (Carnahan 1975;

Soghikian 1992; Friedman 1996; Bailey 1998; Mehos 2000; Vetter 2000; Rogers 2001; Haynes 1976; Johnson 1978; Artinian 2001; Midanik 1991; Rudd 2004),showed that self-monitoring was associated with a significant reduction of -2.03 mmHg (95% CI -2.69 to -1.38 mmHg). In the four RCTs that reported on control of blood pressure (Pierce 1984,Rogers 2001; Vetter 2000; Earp 1982), there was a trend towards improved blood pressure control but this was not significant (odds ratio 0.88 (95%CI 0.67 to 1.15). The remaining RCT that did not report any usable data concerning blood pressure control, reported a mean arterial blood pressure difference of 3 mmHg in favour of the intervention (Zarnke 1997). However, this RCT was of a short duration (8 weeks follow-up).

(2) Educational interventions directed to the patient (n=17 RCTs) (Pierce 1984; Sackett 1975; Billault 1995; Burrelle 1986; Earp 1982; Fielding 1994; Gullion 1987; Hamilton 1993; Martinez-Amenos 1990; Morisky 1983; Levine 1979; Muhlhauser 1993; Roca-Cusachs 1991; Tanner 1981; Watkins 1987; Webb 1980; Zismer 1982) .
Seven RCTs reported SBP mean difference, nine RCTs reported DBP mean difference and five reported a measure of BP control. For mean difference in SBP and DBP outcomes pooling of results from individual RCTs produced heterogeneous results, so pooled mean differences are not valid. Mean difference in SBP was reported with a range of difference in mean SBP reported between -15.7mmHg to +0.6 mmHg, mean difference in DBP was reported with a range DBP -8.7 mmHg to +7.1 mmHg. In terms of blood pressure control (five RCTs) there was a trend towards improved blood pressure control but this was not significant (odds ratio 0.66 (95%CI 0.44 to 1.01). Three RCTs did not report relevant outcome data (Gullion 1987; Hamilton 1993; Martinez-Amenos 1990), but did report increases in patient knowledge (Martinez-Amenos 1990). Two of these RCTs reported no difference in blood pressure control (Gullion 1987; Martinez-Amenos 1990). One RCT reported an improvement in SBP but not DBP at 6 months follow-up (Hamilton 1993).

(3) Educational interventions directed to the physician (n=9 RCTs) (Dickinson 1981; Coe 1977; Evans 1986; Hetlevik 1998; McAlister 1986; Montgomery 2000; Ornstein 2004; New 2004; Sanders 2002).
Educational interventions directed towards the physician were associated with a small reduction in systolic blood pressure, pooled mean difference in SBP was -2.03 mmHg, 95% CI -3.45 to -0.62 mmHg. However, educational interventions directed at the physician were not associated with a significant decrease in mean DBP (mean difference -0.43 mmHg, 95% CI -1.12 to +0.27 mmHg) whilst control of blood pressure produced heterogeneous results (reported range 0.77 to 1.05).

(4) Health professional (nurse or pharmacist) led care (n=7 RCTs) (Bogden 1998; Garcia-Pena 2001; Hawkins 1979; Jewell 1988; Logan 1979; Park 1996; Solomon 2002).

Health professional (nurse or pharmacist) led care may be a promising way of delivering care, with the majority of RCTs being associated with improved blood pressure control. For all three outcomes pooling of results from individual RCTs produced heterogeneous results, so pooled mean differences are not valid. Mean difference in SBP was reported in five RCTs with a range of difference in mean SBP from -13 mmHg to mmHg. Mean difference in DBP was reported in six RCTs, ranging from -mmHg to mmHg. Control of blood pressure produced heterogeneous results (reported range 0.12 to 0.86).

(5) Organisational interventions that aimed to improve the delivery of care (n=8 RCTs) (Sackett 1975; Dickinson 1981; Brook 1983; Keeler 1985; Bulpitt 1976; Hypertension 1979; Hypertension 1979a; Hypertension 1982; Robson 1989; Takala 1979; Takala 1983).

For all three outcomes pooling of results from individual RCTs produced heterogeneous results, so pooled mean differences are not valid and the range of mean difference in SBP and DBP is illustrated in MetaView. Of note, the largest RCT, the Hypertension Detection and Follow-Up Program (HDFP), produced substantial reductions in SBP and DBP across the three groups in this RCT (patient were stratified according to level of entry DBP level, weighted mean difference -8.2/-4.2 mmHg, -11.7/-6.5 mmHg, -10.6/-7.6 mmHg for the three strata of entry blood pressure)). At five year follow-up these reductions in blood pressure were associated with a significant reduction in all cause mortality at five years follow-up (6.38% versus 7.78%, risk difference 1.4%).

(6) Appointment reminder systems (n=6 RCTs) (Ahluwalia 1996; Barnett 1983; Bloom 1979; Cummings 1985; Fletcher 1975; Krieger 1999).

In five RCTs reminder systems were associated with an improvement in follow-up. One RCT of a mailed postcard reminder was not associated with improved follow-up (Ahluwalia 1996). The pooled results though favouring appointment reminder systems for follow-up of patients, odds ratio of being lost to follow-up 0.41, 95% confidence interval (CI) 0.32 to 0.51 are heterogenous because of the single outlying RCT and the pooled results should be treated with caution. Four other RCTs (studies classified under the other intervention headings but incorporated some form of reminder intervention such as postal reminders or computer generated feedback) were associated with significantly improved follow-up attendance by patients (Dickinson 1981; Hamilton 1993; Hawkins 1979; Takala 1979; Takala 1983).

DISCUSSION

Key findings from this review.
The main finding from this systematic review are to a large extent dominated by the findings from the largest RCT, the HDFP study (Hypertension 1979; Hypertension 1979a; Hypertension 1982). Though partly intended as a trial to assess the value of sys-

tematic identification of hypertensive patients (Davis 2001), the key ingredients of how patients with established hypertension and taking antihypertensive drug treatment were managed- free care, registration, recall and regular review in tandem with a rigorous stepped care approach to antihypertensive drug treatment- should be emphasized as this multi-faceted intervention was effective in terms of reaching blood pressure goals and reducing all-cause mortality. It is interesting to note that a two-year post trial surveillance study showed that blood pressure control was attenuated when the stepped-care arm of the study was discontinued. This lack of control was associated with a decline in the use of antihypertensive medication (Hypertension 1986).

Other interventions assessed in this systematic review did not produce clear results. None of the interventions were associated with large, clinically important, reductions in either systolic or diastolic pressure, see MetaView. Self-monitoring was associated with a significant decline in diastolic blood pressure and further evaluation in larger RCTs is warranted. Education alone, directed either to patients or health professionals appears unlikely to influence control of blood pressure as a single intervention, as results were highly heterogeneous or of marginal clinical importance. Use of health care professionals such as nurses and pharmacists, though producing significantly heterogeneous results, did have mainly favourable effects, and merit further definitive evaluation in larger RCTs. Lastly, reminders (postal or computer-based) were associated with an improvement in the follow up of patients with hypertension in all RCTs aside from one small study. This finding is consistent with the organisational structure of the HDFP study and re-iterates the importance of systematic recall systems when organising care for hypertensive patients.

Context of other studies.
There are elements identified from this review that appear to be associated with improved blood pressure control and are consistent with findings from observational studies and previous systematic reviews. In a large community-based study, patients who received intensive antihypertensive drug therapy were significantly more likely to have reduced systolic blood pressure of 6.3 mmHg compared to an increase of 4.8 mmHg in those who received less intensive antihypertensive drug therapy (Berlowitz 1998). A more recent observational study showed that antihypertensive drug therapy was initiated or changed in only 38% of episodes of care, despite documented uncontrolled hypertension for at least six months (Davis 2001; Davis 2001; Davis 2001; Oliveria 2002). Lack of practice organisation is associated with a failure to achieve treatment surrogate goals in hypertension, diabetes and secondary prevention of coronary heart disease (Phillips 2001). A recent systematic review of self monitoring also produced similar findings of modest but potentially important benefit (Cappuccio 2004).

We have found substantially more RCT evidence in terms of hypertension management than a recent systematic review that examined interventions used in disease management programmes

for patients with chronic illness (Weingarten 2002). In this review, eight hypertension-related RCTs were cited which provided some evidence of benefit in terms of education directed at the patient and provider (health professional) (Weingarten 2002). In this systematic review of 59 RCTs, the subset of RCTs where the intervention was directed at the patient (n=17) or physician (n= 7) does not support this finding, showing no clinically important evidence for patient or health professional education as an effective implementation strategy in the management of hypertension.

Study limitations.

There are several shortcomings that need to be highlighted in this systematic review. The HDFP study was designed as an intervention that would identify newly diagnosed hypertensive patients and then start or modify antihypertensive treatment in those with untreated as well as uncontrolled hypertension (Davis 2001). A consequence of this study design is that a differential number of people were receiving antihypertensive drug treatment in the two arms, percentage of patients taking antihypertensive medication-higher for stepped care 81.2%, compared to referred care 64.2% at follow-up in year 5 (see details on included studies). So though it appears that the systematic follow-up and stepped care approach in HDFP is an important element in effective clinical care and prompts rigorous antihypertensive drug treatment, it is not possible to distinguish between the independent effect of these interventions on blood pressure control. Several other RCTs included both treated and untreated hypertensive patients and had differential rates of antihypertensive drug prescribing (Vetter 2000; Midanik 1991; Rudd 2004; Ornstein 2004), with rates of prescribing at higher levels in the intervention arm at follow up. Secondly, many RCTs contained multi-faceted interventions that did not fit into a single intervention category. For example several RCTs that were included under categories of patient education, physician education, health professional led care and organisation of care also incorporated some form of reminder intervention such as postal reminders or computer generated feedback (Dickinson 1981; Hamilton 1993; Hawkins 1979; Takala 1979; Takala 1983). Consequently, it has been difficult to attribute how far single elements that make up complex interventions exert their independent effect on blood pressure control. In terms of self monitoring, it is well established that "office" blood pressure readings are around 10-12/5-mmHg higher when compared to ambulatory or self monitored readings (Staessen 1997; Staessen 2004). Several of the RCTs did not make any recommendations about the need for adjustment of target blood pressure readings when self monitoring was the intervention being assessed. This may have attenuated the impact of self monitoring on blood pressure control because of failure to intensify treatment. Poor adherence to therapy is thought to be associated with poor control of blood pressure (Shea 1992). Only a few trials examined the relation between adherence to medication and control of blood pressure (Haynes 1976; Johnson 1978; Sackett 1975). Future studies will need to be designed to assess the relationship between poor adherence and poor response

to antihypertensive drugs in patients with good adherence. Lastly, not all RCTs reported on the outcomes of blood pressure achieved or blood pressure control. This has meant that the relevant a priori outcomes have not been reported for all included RCTs, and pooling of data from all RCTs has not been possible.

AUTHORS' CONCLUSIONS

Implications for practice

Despite the limitations important messages emerge from this systematic review. Effective delivery of hypertensive care requires a systematic approach in the community, incorporating regular review of patients and a willingness to intensify antihypertensive drug treatment, usually by adding additional classes of antihypertensive drugs, when blood pressure goals are not being met (Hypertension 1979; Hypertension 1979a; Hypertension 1986Davis 2001). This approach of intensive drug therapy and "tight" control of blood pressure has been demonstrated to be possible in clinical trials in hypertensive and diabetic patients alike (Hansson 1999; UK PDS 1998). There are reports of successful systematic care of hypertensive patients in the community over a 20 year period (Hart 1991), but the challenge is to translate these findings into usual clinical care.

Implications for research

In terms of future studies, careful preliminary work is needed when developing and testing complex interventions and thought needs to be given as to how individual and combined effects are measured (Campbell 2000). Aside from definitive RCTs examining the effects of self-monitoring and allied health professional led care (pharmacist and nurses), there is also a paucity of evidence in terms of computer-based clinical decision support systems (CDSSs) in hypertension and how adherence-enhancing strategies influence subsequent blood pressure control (Ebrahim 1998). HDFP was a well-funded study with substantial staffing resources. This meant that the "stepped care" intervention was provided by a highly motivated workforce. An economic evaluation of delivering organised care to hypertensive patients should accompany future studies. Lastly, none of the included RCTs attempted to manage hypertension in the context of overall cardiovascular risk. Future studies need to be congruent with hypertension guidelines that recommend treatment and control of blood pressure in combination with multi-factorial risk reduction (Ramsay 1999).

Conclusions

Effective delivery of hypertension care in the community requires a rigorous approach in terms of identification, follow-up and treatment with antihypertensive drugs. This systematic review shows that such an approach is likely to translate into reductions blood pressure plus reductions in cardiovascular mortality and morbidity (Hypertension 1979; Hypertension 1979a; Hypertension 1986;

Davis 2001). Supplementary and alternative models of care, including self monitoring of blood pressure by patients, blood pressure management by allied health care professionals and CDSSs require further development and evaluation. Educational interventions directed to either patients or health professionals alone are unlikely to produce clinically important reductions in either systolic or diastolic blood pressure.

POTENTIAL CONFLICT OF INTEREST

None declared

ACKNOWLEDGEMENTS

SOURCES OF SUPPORT

REFERENCES

References to studies included in this review

Ahluwalia 1996 *{published data only}*
* Ahluwalia J, McNagny S, Kanuru N. *Journal of Health Care for the Poor and Underserved* 1996;**7**:377–389.

Artinian 2001 *{published data only}*
Artinian N, Washington O, Templin T. Effects of home telemonitoring and community-based monitoring on blood pressure control in urban African Americans: A pilot study. *Heart & Lung* 2001;**30**: 191–199.

Bailey 1998 *{published data only}*
Bailey B, Carney S, Gillies A, Smith AJ. Antihypertensive drug treatment: a comparison of usual care with self blood pressure measurement. *Journal of Human Hypertension* 1998;**13**:147–150.

Barnett 1983 *{published data only}*
Barnett GO, Winickoff RN, Morgan MM, Zielstorff RD. A computer-based monitoring system for follow-up of elevated blood pressure. *Medical Care* 1983;**21**(4):400–409.

Billault 1995 *{published data only}*
Billault B, Degoulet P, Devries C, Plouin PF, Chatellier G, Menard J. Use of a standardized personal medical record by patients with hypertension: a randomized controlled prospective trial. *MD Computing* 1995;**12**(1):31–35.

Bloom 1979 *{published data only}*
Bloom JR, Jordan SC. From screening to seeking care: removing obstacles in hypertension control. *Preventive Medicine* 1979;**8**(4):500–506.

Bogden 1998 *{published data only}*
Bogden P, Abbott R, Williamson P, Onopa J, Koontz L. Comparing standard care with a physician and pharmacist team approach for uncontrolled hypertension. *Journal of General Internal Medicine YR: 1998* 1998;**13**:740–5.

Brook 1983 *{published data only}*
Brook RH, Ware JE, Jr, Rogers WH, Keeler EB, Davies AR, Donald CA, Goldberg GA, Lohr KN, Masthay PC, Newhouse JP. Does free care improve adults' health? Results from a randomized controlled trial. *New England Journal of Medicine* 1983;**309**(23):1426–1434.

Bulpitt 1976 *{published data only}*
Bulpitt CJ, Beilin LJ, Coles EC, Dollery CT, Johnson BF, Munro-Faure, AD, Turner SC. Randomised controlled trial of computer-held medical records in hypertensive patients. *British Medical Journal* 1976;**1**(6011):677–679.

Burrelle 1986 *{published data only}*
Burrelle TN. Evaluation of an interdisciplinary compliance service for elderly hypertensives. J Geriatr Drug Ther YR:1986 1(2):23–51'.

Carnahan 1975 *{published data only}*
Carnahan JE, Nugent CA. The effects of self-monitoring by patients on the control of hypertension. *American Journal of the Medical Sciences* 1975;**269**(1):69–73.

Coe 1977 *{published data only}*
Coe FL, Norton E, Oparil S, Tatar A, Pullman TN. Treatment of hypertension by computer and physician-a prospective controlled study. *Journal of Chronic Diseases* 1977;**30**(2):81–92.

Cummings 1985 *{published data only}*
Cummings KM, Frisof KB, Demers P, Walsh D. An appointment reminder system's effect on reducing the number of hypertension patients who drop out from care. *American Journal of Preventive Medicine* 1985;**1**(5):54–60.

Dickinson 1981 *{published data only}*

Dickinson JC, Warshaw GA, Gehlbach SH, Bobula JA, Muhlbaier LH, Parkerson GR, Jr. Improving hypertension control: impact of computer feedback and physician education. *Medical Care* 1981;**19**(8):843–854.

Earp 1982 *{published data only}*

Earp JA, Ory MG, Strogatz DS. The effects of family involvement and practitioner home visits on the control of hypertension. *American Journal of Public Health* 1982;**72**(10):1146–1154.

Evans 1986 *{published data only}*

Evans CE, Haynes RB, Birkett NJ, Gilbert JR, Taylor DW, Sackett DL, Johnston ME, Hewson SA. Does a mailed continuing education program improve physician performance? Results of a randomized trial in antihypertensive care. *JAMA* 1986;**255**(4):501–504.

Fielding 1994 *{published data only}*

Fielding JE, Knight K, Mason T, Klesges RC, Pelletier KR. Evaluation of the IMPACT blood pressure program. *Journal of Occupational Medicine* 1994;**36**(7):743–746.

Fletcher 1975 *{published data only}*

Fletcher SW, Appel FA, Bourgeois MA. Management of hypertension. Effect of improving patient compliance for follow-up care. *JAMA* 1975;**233**(3):242–244.

Friedman 1996 *{published data only}*

Friedman RH, Kazis LE, Jette A, Smith MB, Stollerman J, Torgers J, Carey K. A telecommunications system for monitoring and counseling patients with hypertension. Impact on medication adherence and blood pressure control. American Journal of Hypertension 1996;9(4 Pt 1):285–92.

Garcia-Pena 2001 *{published data only}*

Garcia-Pena C, Thorogood M, Armstrong B, Reyes-Frausto S, Munoz O. Pragmatic randomized trial of home visits by a nurse to elderly people with hypertension in Mexico. *International Journal of Epidemiology* 2001;**30**:1485–1491.

Gullion 1987 *{published data only}*

Gullion DS, Tschann JM, Adamson TE. Physicians' management of hypertension: a randomized controlled CME trial. *Proceedings of the --- Annual Conference on Research in Medical Education* 1987;**26**:115–120.

Hamilton 1993 *{published data only}*

Hamilton G, Roberts S, Johnson J, Tropp J, Anthony-Odgren D, Johnson B. Increasing adherence in patients with primary hypertension: an intervention. Health Values 1993; 17:3–11.

Hawkins 1979 *{published data only}*

Hawkins D, Fridler F, Douglas H, Eschbach R. Evaluation of a clinical pharmacist in caring for hypertensive and diabetic patients. American Journal of Hosptial Pharmacy 1979; 36:1321–5.

Haynes 1976 *{published data only}*

Haynes RB, Sackett DL, Gibson ES, Taylor DW, Hackett BC, Roberts RS, Johnson AL. Improvement of medication compliance in uncontrolled hypertension. *Lancet* 1976;**1**(7972):1265–1268.

Hetlevik 1998 *{published data only}*

Hetlevik I, Holmen J, Kruger O, Kristensen P, Iversen H. Implementing Clinical Guidelines in the Treatment of Hypertension in General Practice. *Blood Pressure* 1998;**7**:270–276.

Hetlevik 1999 *{published data only}*

Hetlevik I, Holmen J, Kruger O. Implementing clinical guidelines in the treatment of hypertension in general practice Evaluation of patient outcome related to implementation of a computer-based clinical decision support system. *Scandinavian Journal of Primary Health Care* 1999;**17**:35–40.

Hypertension 1979 *{published data only}*

Hypertension Detection, Follow-up Program. Therapeutic control of blood pressure in the Hypertension Detection and Follow-up Program. Hypertension Detection and Follow-up Program Cooperative Group. *Preventive Medicine* 1979;**8**(1):2–13.

Hypertension 1979a *{published data only}*

Hypertension detection, follow-up Program Cooperative Group. Five-year findings of the hypertension detection and follow-up program I. Reduction in mortality of persons with high blood pressure, including mild hypertension. *Journal of the American Medical Association* 1979;**242**(23):2562–2571.

Hypertension 1982 *{published data only}*

Hypertension detection, follow-up Program Cooperative Group. The effect of treatment on mortality in "mild" hypertension Results of the Hypertension Detection and Follow-up Program. *The New England Journal of Medicine* 1982;**307**(16):976–980.

Hypertension 1986 *{published data only}*

Hypertension detection, follow-up Program Cooperative Group. Persistence of reduction in blood pressure and mortality of participants in the hypertension detection and follow-up program. *Journal of the American Medical Association* 1986;**259**(14):2113–2122.

Jewell 1988 *{published data only}*

Jewell D, Hope J. Evaluation of a nurse-run hypertension clinic in general practice. *Practitioner* 1988;**232**(1447):484–487.

Johnson 1978 *{published data only}*

Johnson AL, Taylor DW, Sackett DL, Dunnett CW, Shimizu AG. Self-recording of blood pressure in the management of hypertension. *Canadian Medical Association Journal* 1978;**119**(9):1034–1039.

Krieger 1999 *{published data only}*

Krieger J, Collier C, Song L, Martin D. Linking community-based blood pressure measurement to clinical care: a randomized controlled trial of outreach and tracking by community health workers. *American Journal of Public Health* 1999;**89**:856–861.

Levine 1979 *{published data only}*

Levine DM, Green LW, Deeds SG, Chwalow J, Russell RP, Finlay J. Health education for hypertensive patients. *JAMA* 1979;**241**(16):1700–1703.

Logan 1979 *{published data only}*

Logan AG, Milne BJ, Achber C, Campbell WP, Haynes RB. Work-site treatment of hypertension by specially trained nurses. A controlled trial. *Lancet* 1979;**2**(8153):1175–1178.

Martinez-Amenos 1990 *{published data only}*

Martinez-Amenos A, Fernandez Ferre ML, Mota Vidal C, Alsina Rocasalbas, J. Evaluation of two educative models in a primary care hypertension programme. *Journal of Human Hypertension* 1990;**4**(4):362–364.

McAlister 1986 *{published data only}*

McAlister NH, Covvey HD, Tong C, Lee A, Wigle ED. Randomised controlled trial of computer assisted management of hypertension in

primary care. *British Medical Journal Clinical Research Ed* 1986;. **293** (6548):670–674.

Mehos 2000 *{published data only}*

Mehos BM, Saseen JJ, MacLaughlin EJ. Effect of Pharmacist Intervention and Initiation of Home Blood Pressure Monitoring in Patients with Uncontrolled Hypertension. *Pharmacotherapy* 2000;**20** (11):1384–1389.

Midanik 1991 *{published data only}*

Midanik LT, Resnick B, Hurley LB, Smith EJ, McCarthy M. Home blood pressure monitoring for mild hypertensives. *Public Health Reports* 1991;**106**(1):85–89. 1039.

Montgomery 2000 *{published data only}*

Montgomery AA, Fahey T, Peters TJ, MacKintosh C, Sharp D. Evaluation of a computer-based clinical decision support system and chart guidelines in the management of hypertension in primary care: a randomised controlled trial. *British Medical Journal* 2000;**320**:686–690.

Morisky 1983 *{published data only}*

Morisky DE, Levine DM, Green LW, Shapiro S, Russell RP, Smith CR. Five-year blood pressure control and mortality following health education for hypertensive patients. *American Journal of Public Health* 1983;**73**(2):153–162.

Muhlhauser 1993 *{published data only}*

Muhlhauser I, Sawicki PT, Didjurgeit U, Jorgens V, Trampisch HJ, Berger M. Evaluation of a structured treatment and teaching programme on hypertension in general practice. *Clinical & Experimental Hypertension* 1993;**15**(1):125–142.

New 2004 *{published data only}*

New J, Mason J, Freemantle N, Teasdale S, Wong L, Bruce N, Burns J, Gibson J. Educational outreach in diabetes to encourage practice nurses to use primary care hypertension and hyperlipidaemia guidelines (EDEN): a randomized controlled trial. *Diabetic Medicine* 2004; **21**:599–603. 2956.

Ornstein 2004 *{published data only}*

Ornstein S, Jenkins R, Nietert P, Feifer C, Roylance L, Nemthe L, Corley S, Dickerson L, Bradford D, Litvin C. A multimethod quality improvement intervention to improve preventive cardiovascular care. *Annals of Internal Medicine* 2004;**141**:523–532. 2960.

Park 1996 *{published data only}*

Park JJ, Kelly P, Carter BL, Burgess PP. Comprehensive Pharmaceutical Care in the Chain Setting. Drug therapy monitoring and counseling be pharmacists contributed to improved blood pressure control in study patients. *Journal of the American Pharmaceutical Association* 1996;**NS36**(7):443–451.

Pierce 1984 *{published data only}*

Pierce JP, Watson DS, Knights S, Gliddon T, Williams S, Watson R. A controlled trial of health education in the physician's office. *Preventive Medicine* 1984;**13**(2):185–194.

Robson 1989 *{published data only}*

Robson J, Boomla K, Fitzpatrick S, Jewell AJ, Taylor J, Self J, Colyer M. Using nurses for preventive activities with computer assisted follow up: a randomised controlled trial. *BMJ* 1989;**298**(6671):433–436.

Roca-Cusachs 1991 *{published data only}*

Roca-Cusachs A, Sort D, Altimira J, Bonet R, Guilera E, Monmany J, Nolla J. The impact of a patient education programme in the control of hypertension. *Journal of Human Hypertension* 1991;**5**(5): 437–441.

Rogers 2001 *{published data only}*

Rogers M, Small D, Buchan D, Butch C, Stewart C, Krenzer B, Husovsky H. Home monitoring services improves mean arterial pressure in patients with essential hypertension. *Annals of Internal Medicine* 2001;**134**:1024–1032.

Rudd 2004 *{published data only}*

Rudd P, Houston Miller N, Kaufman J, Kraemer H, Bandura A, Greenwald G, Debusk R. Nurse management for hypertension: a systems approach. *American Journal of Hypertension* 2004;**17**:921–927. 2959.

Sackett 1975 *{published data only}*

Sackett DL, Haynes RB, Gibson ES, Hackett BC, Taylor DW, Roberts RS, Johnson AL. Randomised clinical trial of strategies for improving medication compliance in primary hypertension. *Lancet* 1975;**1**(7918):1205–1207.

Sanders 2002 *{published data only}*

Sanders K, Satyvavolu A. Improving blood pressure control in diabetes: limitations of a clinical reminder in influencing physician behaviour. *The Journal of Continuing Education in the Health Professions* 2002;**22**:23–32. 2963.

Soghikian 1992 *{published data only}*

Soghikian K, Casper SM, Fireman BH, Hunkeler EM, Hurley LB, Tekawa, IS, Vogt TM. Home blood pressure monitoring. Effect on use of medical services and medical care costs. *Medical Care* 1992;**30** (9):855–865.

Solomon 2002 *{published data only}*

Solomon D, Portner T, Bass G, Gourley D, Gourley G, Holt J, Wicke W, Braden R, Eberle T, Self T, Lawrence B. Part 2. Clinical and economic outcomes in the hypertension and COPD arms of a mulitcenter outcomes study. Journal of the American Pharmaceutical Association 2002; 38:574–84.

Takala 1979 *{published data only}*

Takala J, Niemela N, Rosti J, Sievers K. Improving compliance with therapeutic regimens in hypertensive patients in a community health center. *Circulation* 1979;**59**(3):540–543.

Takala 1983 *{published data only}*

Takala J. Screening, treatment and adherence to treatment for hypertension. *Scandinavian Journal of Primary Health Care* 1983;**1**(3-4):114–119.

Tanner 1981 *{published data only}*

Tanner GA, Noury DJ. The effect of instruction on control of blood pressure in individuals with essential hypertension. *Journal of Advanced Nursing* 1981;**6**(2):99–106.

Vetter 2000 *{published data only}*

Vetter W, Brignoli R. Influence of self-measurement of blood pressure on the responder rate in hypertensive patients treated with losartan: results of the SVATCH study. *Journal of Human Hypertension* 2000; **14**:235–241.

Watkins 1987 *{published data only}*

Watkins CJ, Papacosta AO, Chinn S, Martin J. A randomized controlled trial of an information booklet for hypertensive patients in general practice. *Journal of the Royal College of General Practitioners* 1987;**37**(305):548–550.

Webb 1980 *{published data only}*

Webb PA. Effectiveness of patient education and psychosocial counseling in promoting compliance and control among hypertensive patients. *Journal of Family Practice* 1980;**10**(6):1047–1055.

Zarnke 1997 *{published data only}*

Zarnke K, Feagan B, Mahon J, Feldman R. A randomized study comparing a patient-directed hypertension management strategy with usual office-based care. *American Journal of Hypertension* 1997;**10**: 58–67.

Zismer 1982 *{published data only}*

Zismer DK, Gillum RF, Johnson CA, Becerra J, Johnson TH. Improving hypertension control in a private medical practice. *Archives of Internal Medicine* 1982;**142**(2):297–299.

References to studies excluded from this review

Andrejak 2000

Andrejak M, Genes N, Vaur L, Poncelet P, Clerson P, Carre A. Electronic Pill-Boxes in the Evaluation of Antihypertensive Treatment Compliance: Comparison of Once Daily Versus Twice Daily Regimen. *American Journal of Hypertension* 2000;**13**:184–190. 1365.

Bachman 2002

Bachman L, Steurer J, Holm D, Vetter W. To what extent can we trust home blood pressure measurement? A randomized controlled trial. *The Journal of Clinical Hypertension* 2002;**4**:405–407. 2962.

Barron-Rivera 1998

Barron-Rivera AJ, Torreblaca-Roldan FL, Sanchez-Casanova LI, Martinez-Beltran M. Effect of an educational intervention on the quality of life of the hypertense patient. Salud Publica de Mexico YR: 1998 40(6):503–9. 1362.

Ben Said

Ben Said M, Consoli SM, Jean J. A comparative study between a computer-aided education (ISIS) and habitual education techniques for hypertensive patients. Proceedings - the Annual Symposium on Computer Applications in Medical Care YR:1994 [MedLine: 1373.

Binstock 1988

Binstock ML, Franklin KL. A comparison of compliance techniques on the control of high blood pressure. *Am J Hypertens* 1988;**1**: 192S-1944S.

Birtwhistle 2004

Birtwhistle RV, Godwin MS, Delva MD, Casson RI, Lam M, MacDonald SE, Seguin R, Ruhland L. Randomised equivalence trial comparing three month and six month follow up of patients with hypertension by family practitioners. *BMJ* 2004;**328**(7433):204–0.

Blenkinsopp 2000

Blenkinsopp A, Phelan M, Bourne J, Dakhil N. Extended adherence support by community pharmacists for patients with hypertension: a randomised controlled trial. *The International Journal of Pharmacy Practice* 2000;**8**:165–175.

Bond 1984

Bond CA, Monson R. Sustained improvement in drug documentation, compliance, and disease control. A four-year analysis of an ambulatory care model. *Archives of Internal Medicine* 1984;**144**(6): 1159–1162. 906.

Broege 2001

Broege P, James GD, Pickering TG. Management of hypertension in the elderly using home blood pressures. *Blood Pressure Monitoring* 2001;**6**:139–144.

Cappuccio 2004

Cappuccio FP, Kerry SM, Forbes L, Donald A. Blood pressure control by home monitoring: meta-analysis of randomised trials. *BMJ* 2004: bmj.

Caro 1998

Caro JJ, Speckman JL. Existing treatment strategies: does nocompliance make a difference?. *Journal of Hypertension* 1998;**16**(Supplement 7):S31–S34. 1358.

Celis 1998

Celis H, Staessen JA, Buntinz F, Fagard R, Leeman M, Thijs L, Van Hedent T. Antihypertensive treatment based on home or office blood pressure measurement: protocol of the randomized controlled THOP trial. *Blood Pressure Monitoring* 1998;**3**(Supplement 1):S29–S35. 1356.

Charlesworth 1984

Charlesworth EA, Williams BJ, Baer PE. Stress management at the worksite for hypertension: compliance, cost-benefit, health care and hypertension-related variables. *Psychosomatic Medicine* 1984;**46**(5): 387–397. 827.

Consoli

Consoli SM, Ben Said M, Jean J, Menard J, Plouin PF, Chatelier G. Interactive electronic teaching (ISIS); has the future started?. Journal of Human Hypertension YR:1996 10(Supplement 1):S69–S72. 1370.

Consoli SM, Ben2

Consoli SM, Ben Said M, Jean J, Menard J, Plouin PF, Chatellier G. Benefits of a computer-assisted education program for hypertensive patients compared with standard education tools. Patient Education & Counselling YR:1995 26(1-3):343–7. 1371.

Consoli SM, Ben3

Consoli SM, Ben Said M, Jean J, Menard J, Plouin PF, Chatelier G. Evaluation of a computer assisted training program for hypertensive patients. Archives des Maladies du Coeur et des Vaisseaux YR:1994 87(8):1093–6. 1372.

Cranney 1999

Cranney M, Barton S, Walley T. Addressing barriers to change: an RCT of practice-based education to improve the management of hypertension in the elderly. *British Journal of General Practice* 1999; **49**:522–526. 1344.

Denver 2003

Denver E, Barnard M, Woolfson R, Earle K. Management of uncontrolled hypertension in a nurse-led clinic compared with conventional care for patients with Type 2 diabetes. *Diabetic Care* 2003;**26**: 2256–2260. 2958.

Djerassi 1990

Djerassi L, Silverberg DS, Goldblatt H, Goldberg A, Porat V. Comparison of hypertension treatment on and off the worksite. *Journal of Human Hypertension* 1990;**4**(4):322–325. 610.

Dusing 1998

Dusing R, Weisser B, Mengden T, Vetter H. Changes in Antihypertensive Therapy - The Role of Adverse Effects and Compliance. *Blood Pressure* 1998;**7**:313–315. 1368.

Erickson 1997

Erickson SR, Slaughter R, Halapy H. Pharmacists' Ability to Influence Outcomes of Hypertension Therapy. *Pharmacotherapy* 1997;**17**(1):140–147. 1389.

Flack 1995

Flack JM, Novikov SV, Ferrario CM. Benefits of adherence to anti-hypertensive drug therapy. *European Heart Journal* 1995;**17**(Supplement A):16–20. 1387.

Flack 2000

Flack JM, Yunis C, Preisser J, Holmes CB, Mensah G, McLean B, Saunders E. The Rapidity of Drug Dose Escalation Influences Blood Pressure Responses and Adverse Effects Burden in Patients With Hypertension. The Quinapril Titration Interval Management Evaluation (ATIME) Study. *Archives of Internal Medicine* 26-6-2000;**160**: 1842–1847. 1384.

Foote 1983

Foote A, Erfurt JC. Hypertension control at the work site. Comparison of screening and referral alone, referral and follow-up, and on-site treatment. *New England Journal of Medicine* 1983;**308**(14): 809–813. 292.

Girvin 1999

Girvin B, McDermott J, Johnston GD. A comparison of enalapril 20 mg once daily versus 10 mg twice daily in terms if blood pressure lowering patient compliance. *Journal of Hypertension* 1999;**17**:1627–1631. 1360.

Godley 2003

Godley P, Nguyen A, Yokoyama K, Rohack J, Woodward B, Chiang T. Improving hypertension care in a large group-model MCO. *American Journal of Health-System Pharmacy* 2003;**60**:554–563. 2964.

Gonzalez-Fernandez

Gonzalez-Fernandez RA, Rivera M, Torres D, Quiles J, Jackson A. Usefulness of a systemic hypertension in-hospital educational program. *American Journal of Cardiology* 1990;**65**(20):1384–1386.

Grimm

Grimm RH, Jr, Grandits GA, Cutler JA, Stewart AL, McDonald RH, Svendsen K, Prineas RJ, Liebson PR. Relationship of Quality-of-Life measures to Long-term Lifestyle and Drug Treatment in the Treatment of Mild Hypertension Study. *Archives of Internal Medicine* 1997;**157**:638–648. 1386.

Hatcher 1986

Hatcher ME, Green LW, Levine DM, Flagle CE. Validation of a decision model for triaging hypertensive patients to alternate health education interventions. *Social Science & Medicine* 1986;**22**(8):813–819. 836.

Herbert 2004

Herbert CP, Wright JM, Maclure M, Wakefield J, Dormuth C, Brett-MacLean P, Legare J, Premi J. Better Prescribing Project: a randomized controlled trial of the impact of case-based educational modules and personal prescribing feedback on prescribing for hypertension in primary care. *Family Practice* 2004;**21**(5):575–581. 2955.

Hyman

Hyman DJ, Pavlik VN. Self-reported Hypertension Treatment Practices Among Primary Care Physicians. Blood Pressure Thresholds, Drug Chocies, and the Role of Guidelines and Evidence-Based Medicine. *Archives of Internal Medicine* 2002;**160**:2281–2286. 1385.

Inui 1976

Inui TS, Yourtee EL, Williamson JW. Improved outcomes in hypertension after physician tutorials. A controlled trial. *Annals of Internal Medicine* 1976;**84**(6):646–651. 132.

Iso 1996

Iso H, Shimamoto T, Yokota K, Sankai T, Jacobs DR, Komachi Y. Community-Based Education classes for hypertension control. *Hypertension* 1996;**27**:968–974. 1342.

Iso H,

Iso H, Shimamoto T, Yokota K, Sankai T, Jacobs DR. Community-Based Education Classes for Hypertension Control. A 1.5-Year Randomized Controlled Trial. *Hypertension* 1996;**27**:968–974. 1367.

Kawachi 1991

Kawachi I, Malcolm LA. The cost-effectiveness of treatingmild-to-moderate hypertension: a reappraisal. *Journal of Hypertension* 1991; **9**:199–208. 1382.

Krishan 1979

Krishan I, Brennan LA, Jr, Nobrega FT, Smoldt RK, Smutka LK, Labarthe, DR, McEnaney JA, Hunt JC. The Mayo Three-Community Hypertension Control Program. II. Outcome of intervention in entire communities. *Mayo Clinic Proceedings* 1979;**54**(5):299–306. 236.

Lewis 1967

Lewis CE, Resnik BA. Nurse clinics and progressive ambulatory patient care. *The New England Journal of Medicine* 7-12-1967;**277**(23): 1236–1241. 1375.

Linjer 1997

Linjer E, Hansson L. Underestimation of the true benefits of anti-hypertensive treatment: an assessment of some important sources of error. *Journal of Hypertension* 1997;**15**:221–225. 1383.

Littenberg 1990

Littenberg B, Garber AM, Sox HC. Screening for Hypertension. *Annals of Internal Medicine* 1-2-1990;**112**(3):192–202. 1380.

Marquez 2000

Marquez Contreras E, Casado Martinez JJ, Celotto Gomez B, Gascon Vivo J, de Martin Pablos JL, Gil Rodriguez R, Lopez Molina V, Dominguez YR. Therapeutic compliance in hypertension. Trial of two-year health education intervention. Atencion Primaria YR:2000 26(1):5–10. 1363.

Mashru 1997

Mashru M, Lant A. Interpractice audit of diagnosis and management of hypertension in primary care: educational intervention and review of medical records. *British Medical Journal* 1997;**314**:942–946. 1351.

McDowell 1989

McDowell I, Newell C, Rosser W. A randomized trial of computerized reminders for blood pressure screening in primary care. *Medical Care* 1989;**27**(3):297–305. 645.

McInnes 1995

McInnes GT, McGhee SM. Delivery of care for hypertension. *Journal of Human Hypertension* 1995;**9**:429–433. 1369.

McKenney 1973

McKenney JM, Slining JM, Henderson HR, Devins D, Barr M. The effect of clinical pharmacy services on patients with essential hypertension. *Circulation* 1973;**48**(5):1104–1111. 1194.

Murray 1988

Murray DM, Kurth CL, Finnegan JR, Jr, Pirie PL, Admire JB, Luepker RV. Direct mail as a prompt for follow-up care among persons at risk for hypertension. *American Journal of Preventive Medicine* 1988; **4**(6):331–335. 543.

New 2003

New J, Mason J, Freemantle N, Teasdale S, Wong L, Bruce N, Burns J, Gibson J. Specialist nurse-led intervention to treat and control hypertension and hyperlipidemia in Diabetes (SPLINT). *Diabetic Care* 2003;**26**:2250–2254. 2957.

Pheley 1995

Pheley AM, Terry P, Pietz L, Fowles J, McCoy CE, Smith H. Evaluation of a nurse-based hypertension managment program: Screening, management, and outcomes. *The Journal of Cardiovascular Nursing* 1995;**9**(2):54–61. 1355.

Putnam 1989

Putnam RW, Curry L. Physicians' participation in establishing criteria for hypertension management in the office: will patient outcomes be improved?. *Canadian Medical Association Journal* 1989;**140**(7):806–809. 726.

Ramsay 1996

Ramsay LE, Haq IU, Yeo WW, Jackson PR. Interpretation of prospective trials in hypertension: do treatment guidelines accurately reflect current evidence?. *Journal of Hypertension* 1996;**14**(Supplement 5): S187–S194. 1381.

Staessen 2004

Staessen J, Den Hond E, Celis H, Fagard R, Keary L, Vandenhoven G, O'Brien ET. Antihypertensive treatment based on blood pressure measurement at home or in the physician's office. *Journal of the American Medical Association* 2004;**291**:955–964.

Stahl 1984

Stahl SM, Kelley CR, Neill PJ, Grim CE, Mamlin J. Effects of home blood pressure measurement on long-term BP control. *American Journal of Public Health* 1984;**74**(7):704–709. 713.

Statson 1977

Statson WB, Weinstein MC. Public-Health Rounds at the Harvard School of Public Health. allocation of Resources to Manage Hypertension. *The New England Journal of Medicine* 31-3-1977;**296**(13): 732–739. 1379.

Stephenson 1999

Stephenson J. Noncompliance May Cause Half of Antihypertensive Drug "Failures". *JAMA* 28-6-1999;**282**(4):313–314. 1378.

Trocha 1999

Trocha AK, Schmidtke C, Didjurgeit U, Muhlhauser I, Bender R, Berger M, Sawicki PT. Effects of intensified antihypertensive treatment in diabetic nephropathy: mortality and morbidity results of a prospective controlled 10-year study. *Journal of Hypertension* 1999; **17**:1497–1503. 1374.

Tu 1999

Tu M. The effect of health education on self-care behaviours and hypertension control in elderly hypertensive patients at a veterans home. *Chinese Journal of Public Health* 1999;**18**:54–65. 1405.

UK PDS 1998

UK Prospective Diabetes Study Group. Tight Blood pressure control and risk of macrovascular and microscular complications in type 2 diabetes: UKPDS 38. *British Medical Journal* 12-9-1998;**317**:703–713. 1377.

van den Hoogen 1990

van den Hoogen JP, van Ree JW. Preventive cardiology in general practice: computer-assisted hypertension care. *Journal of Human Hypertension* 1990;**4**(4):365–367. 606.

Waeber 1999

Waeber B, Leonetti G, Kolloch R, McInnes GT. Compliance with asprin or placebo in the hypertension optimal treatment (HOT) study. *Journal of Hypertension* 1999;**17**:1041–1045. 1388.

Weiner 1980

Weiner EE. Nurse management of hypertension. *American Journal of Nursing* 1980;**80**(6):1129.

Weir 2002

Weir MR, Maibach EW, Bakris GL, Black HR, Chawla P, Messerli FH, Neutel JM, Weber MA. Implications of a health Lifestyle and Medication Analysis for Improving Hypertension Control. *Archives of Internal Medicine* 28-2-0002;**160**:481–490. 1359.

Wollard 1995

Wollard J, Beilin L, Lord T, Puddey I, MacAdam D, Rouse I. A controlled trial of nurse counselling on lifestyle change for hypertensives treated in general practice: preliminary results. *Clinical and Experimental Pharmacology and Physiology* 1995;**22**:466–468. 1366.

Wyka-Fitzgerald 1984

Wyka-Fitzgerald C, Levesque P, Panciera T, Vendettoli D, Mattea E. Long-term evaluation of group education for high blood pressure control. *Cardiovascular Nursing* 1984;**20**(3):13–18. 728.

Zernike 1998

Zernike W, Henderson A. Evaluating the effectiveness of two teaching strategies for patients diagnosed with hypertension. *Journal of Clinical Nursing* 1998;**7**:37–44. 1364.

References to ongoing studies

Coppola

Improving the primary prevention of stroke in older patients in general practice: a randomized controlled trial. Ongoing study Not known.

Krieger

SHIP Clinic-Based Program. Ongoing study Not known.

McManus

A randomised controlled trial of patient held targets and self monitoring in the control of hypertension: Targets And Self Monitoring IN Hypertension (TASMINH). Ongoing study September 2001, last patient randomised March 2002, final follow up March 2003.

Sullivan

HYPER Trial. Ongoing study August 1999.

Zarnke

Not known. Ongoing study Not known.

Additional references

Berlowitz 1998

Berlowitz D, Ash A, Hickey E, Friedman R, Glickman M, Kader B, Moskowitz M. Inadequate management of blood pressure in a hypertensive population. *The New England Journal of Medicine* 1998; **339**:1957–1963. 1364.

Blood 2000

Blood pressure lowering Treatment Trialists' Collaboration. Effects of ACE inhibitors, calcium antagonists, and other blood pressure lowering drugs: results of prospectively designed overviews of randomised trials. *Lancet* 2000;**356**:1955–1964. 1670.

Bobrie 2004

Bobrie G, Chatellier G, Genes N, Clerson P, Vaur L, Vaisse B, Menard J, Mallion JM. Cardiovascular prognosis of "masked hypertension" detected by blood pressure self-measurement in elderly treated hypertensive patients. *Journal of the American Medical Association* 2004;**291**:1342–1349.

Burnier 2002

Burnier M. Blood pressure control and the implementation of guidelines in clinical practice: can we fill the gap?. *Journal of Hypertension* 2002;**20**:1251–1253. 1997.

Campbell 2000

Campbell M, Fitzpatrick R, Haines A, Kinmonth AL, Sandercock P, Spiegelhalter D, Tyrer P. Framework for design and evaluation of complex interventions to improve health. *British Medical Journal* 2000;**321**:694–696. 1643.

Cappuccio 2004

Cappuccio FP, Kerry SM, Forbes L, Donald A. Blood pressure control by home monitoring: meta-analysis of randomised trials. *BMJ* 2004: bmj. 2870.

Chobanian 2001

Chobanian AV. Control of hypertension - an important national priority. *The New England Journal of Medicine* 16-8-2001;**345**(7): 534–535. 1927.

Clarke 2000

Clarke M, Oxman AD. Assessment of study quality. *The Cochrane Library, Cochrane reviewer's handbook 4.1 [updated June 2000]*. Issue 2 Edition. 2000.[MedLine: 1407].

Collins 1994

Collins R, Peto R. Antihypertensive drug therapy: effects on stroke and coronary heart disease. In: Swales J, editor(s). *Textbook of Hypertension*. Oxford: Blackwell Scientific Publications, 1994.[MedLine: 2160].

Davis 2001

Davis B, Ford C. The Hypertension Detection and Follow up Program. In: Black HR, editor(s). *Clinical trials in Hypertension*. New York: Marcel Dekker Inc, 2001.[MedLine: 1409].

Du 1997

Du X, Cruickshank JK, McNamee R, Saraee M, Sourbutts J, Summers A, Roberts N, Walton E, Holmes S. Case-control study of stroke and the quality of hypertension control in north west England. *British Medical Journal* 1997;**314**:272–276. 1000.

Ebrahim 1998

Ebrahim S. Detection, adherence and control of hypertension for the prevention of stroke: a systematic review. *Health Technology Assessment* 1998;**2**:11. 2164.

Follman 1992

Follman D, Elliott P, Suh I, Cutler J. Variance imputations for overviews of clinical trials with continuous response. *Journal of Clinical Epidemiology* 1992;**45**:769–773. 1408.

Frijling 2001

Frijling B, Spies T, Lobo C, Hulscher M, van Drenth B, Braspenning G, Prins A, van der Woulden J, Grol R. Blood pressure control in treated hypertensive patients: clinical performance of general practitioners. *British Journal of General Practice* 2001;**51**:9–14. 1626.

Gueyffier 1999

Gueyffier F, Bulpitt C, Boissel JP, Schron E, Ekbom T, Fagard R, Casiglia E, Kerlikowske K, Coope J. Antihypertensive drugs in very old people: a subgroup meta-analysis of randomised controlled trials. *Lancet* 1999;**353**:793–796. 2161.

Hansson 1999

Hansson L, Zanchetti A, Carruthers S, Dahlof B, Elmfeldt D, Julius S, Menard J, Rahn K, Wedel H, Westerling S. Effects of intensive blood pressure lowering and low dose aspirin in patients with hypertension: principal results of the Hypertension Optimal Treatment (HOT) randomised trial. *Lancet* 1999;**351**:1755–1762. 1478.

Hart 1991

Hart JT, Thomas C, Gibbons B, Edwards C, Hart M, Jones J, Jones M, Walton P. Twenty five years of case finding and audit in a socially deprived community [see comments]. *BMJ* 1991;**302**(6791):1509–1513. 1220.

Hyman 2001

Hyman DJ, Pavlik VN. Characteristics of patients with uncontrolled hypertension in the United States. [see comments.]. *New England Journal of Medicine* 2001;**345**(7):479–486. 2157.

Keeler 1985

Keeler EB, Brook RH, Goldberg GA, Kamberg CJ, Newhouse JP. How free care reduced hypertension in the health insurance experiment. *JAMA* 1985;**254**(14):1926–1931. 864.

Oakeshott 2003

Oakeshott P, Kerry S, Austin A, Cappuccio F. Is there a role for nurse-led blood pressure management in primary care?. 2003;**20**(4):469–473. 2816.

Oliveria 2002

Oliveria SA, Lapuerta P, McCarthy BD, L'Italien GJ, Berlowitz DR, Asch SM. Physician-Related Barriers to the Effective Management of Uncontrolled Hypertension. *Annals of Internal Medicine* 2002;**162**: 413–420. 2142.

Payne 1993

Payne JN, Milner PC, Saul C, Bowns I, Hannay DR, Ramsay LE. Local confidential inquiry into avoidable factors in deaths from stroke and hypertensive disease. *British Medical Journal* 1993;**307**:1027–1030. 196.

Phillips 2001

Phillips L, Branch W, Cook C, Doyle J, El-Kebbi I, Gallina D, Miller C, Ziemer D, Barnes C. Clinical inertia. *Annals of Internal Medicine* 2001;**135**:825–834. 1919.

Ramsay 1999

Ramsay LE, Williams B, Johnston G, MacGregor GA, Poston L, Potter JF, Poulter NR, Russell G. Guidelines for the management of hypertension: report of the third working party of the British Hypertension Society. *Journal of Human Hypertension* 1999;**13**:569–592. 1500.

Shea 1992

Shea S, Misra D, Ehrlich M, Field L, Francis C. Predisposing factors for severe, uncontrolled hypertension in an inner-city minority pop-

ulation. *The New England Journal of Medicine* 1992;**327**:776–781. 100.

Smith 1990

Smith WCS, Lee AJ, Crombie IK, Tunstall-Pedoe H. Control of blood pressure in Scotland: the rule of halves. *British Medical Journal* 1990;**300**:981–983. 2163.

Staessen 1997

Staessen JA, Byttebier G, Buntinx F, Celis H, O'Brien ET, Fagard R. Antihypertensive Treatment Based on Conventional or Ambulatory Blood Pressure Measurement A randomised controlled trial. *Journal of the American Medical Association* 1997;**278 No 13**:1065–1072. 1208.

Staessen 2001

Staessen JA, Wang J-G, Thijs L. Cardiovascular protection and blood pressure reduction: a meta analysis. *The Lancet* 20-10-2001;**358**: 1305–1315. 1922.

Staessen 2004

Staessen JA, Den Hond E, Celis H, Fagard R, Keary L, Vandenhoven G, O'Brien E. Antihypertensive treatment based on blood pressure measurement at home or in the physician's office. *JAMA* 2004;**291**: 955–964.

Warsi 2004

Warsi A, Wang P, LaValley M, Avorn J, Solomon D. Self-management eduction programs in chronic disease. *Archives of Internal Medicine* 2004;**164**:1641–1649. 2961.

Weingarten 2002

Weingarten SR, Henning JM, Badamgarav E, Knight K, Hasselblad V, Gano A, Jr, Ofman JJ. Interventions used in disease management programmes for patients with chronic illness---which ones work? Meta-analysis of published reports. *BMJ* 26-10-2002;**325**(7370): 925. 2200.

Wilber 1972

Wilber J, Barrow J. Hypertension: a community problem. *The American Journal of Medicine* 1972;**52**:653–663. 2162.

* Indicates the major publication for the study

T A B L E S

Characteristics of included studies

Study	Ahluwalia 1996
Methods	Parallel, individuals, hospital outpatients in a single hospital clinic, USA
Participants	Hypertensive (SBP 180mmHg and/or DBP 110mmHg), 95% African American, 49% uninsured, mean age 56
Interventions	(1) Mailed reminder- postcard addressed in the presence of the patient and mailed next day as a reminder to attend clinic in a week's time (2) No reminder card, given routine clinic appointment
Outcomes	(1) First follow up visit to walk-in clinic or a continuity medicine clinic- no difference at 6 months (E) 45/53, 85% versus (C) 48/54, 89%

Characteristics of included studies (*Continued*)

	Duration of FU 6 months
Notes	No blood pressure data collected at outcome
Allocation concealment	B

Study	**Artinian 2001**
Methods	Pilot RCT
Participants	Age >18 years, SBP >140mmHg or >90mmHg or for diabetic patients ?130mmHg or ?85mmHg
Interventions	(1) Home BP telemonitoring- self monitoring at home and transmitting BP readings over telephone line to care providers in order to "facilitate telecounselling and treatment planning". BP readings transmitted 3 times per week for 12 weeks. (2) Nurse-managed community based BP monitoring. (3) Usual care
Outcomes	(1) Blood pressure- mean change SBP 25 mmHg, mean change DBP 14mmHg (E) versus mean change SBP +1 mmHg, mean change DBP 2mmHg Duration of FU 3 months
Notes	Small pilot study with short follow up period
Allocation concealment	B

Study	**Bailey 1998**
Methods	Parallel, individuals based in general practitioner surgeries, Australia
Participants	Patients who were about to start BP lowering treatment who did not practice self-measurement, <7% previously untreated, mean age 53.5 years.
Interventions	(1) Self monitoring- use of an OMRON HEM706 monitor. Asked to record BP twice daily for 8 weeks (2) Usual care- no self recording
Outcomes	(1) Blood pressure control- significantly worse (E) 148/89mmHg versus (C) 142/89. (2) Process of medical care-more vigorous in (C) group in terms of increase, addition of medication (3) Compliance (pill count) (E) 88% versus (C) 94% NS Duration of FU 8 weeks
Notes	23% patients were not interested in future self-measurement Outcome assessment: 24 hour ambulatory monitoring Physicians not instructed to achieve a treatment goal or protocol Significant disagreement between self monitoring and office measurement found by 19% physicians and 16% patients. In (E) group negative finding most likely due to the fact that physicians were less likely to alter drug regimen when self-measurement readings were lower than office BP measurement. Finding most likely to due different responses to process of care no protocol concerning treatment intensification was provided in this RCT. No adjustment to the lower self monitor readings were made and no intensification was associated with the intervention
Allocation concealment	B

Study	**Barnett 1983**
Methods	Parallel, individuals based in one community-based health centre in USA.
Participants	Physicians nurse-practitioners (numbers not stated). Patients (n= 115) with sustained hypertension and/or diagnosis of hypertension and placed on therapy, <2 repeat BP measurements after initial visit. 49% female, mean age 43 years (42% older than 45 years), 17% black mean initial BP 150/102mmHg, 7% with history of hypertension, 4% with history of cardiovascular disease, 15% with family history of hypertension, 34% diagnosed obese

Characteristics of included studies (*Continued*)

Interventions	(1) Computer reminder to GP- automated surveillance system utilizing computer-based medical record system, generated automatic reminder to GP to check BP of patients. "No attempt was made to monitor the quality of care as to the degree of BP control". (2) Usual care.
Outcomes	(1) Evaluate extent BP FU was attempted or achieved, (E) 62/63 (98%) versus (C) 24/52 (46%). (2) Repeat BP recorded (E) 44/63 (70%) versus (C) 27/52 (52%). (3) Degree of DBP control achieved (DBP <100mmHg) (E) 44/63 (70%) versus (C) 27/52 (52%). Duration of FU 24 months.
Notes	Intervention improved follow up of patients and in those who were followed up DBP was significantly improved. Stratified according to age (45) and DBP (100mmHg)
Allocation concealment	B

Study	**Billault 1995**
Methods	Parallel, individuals in a single outpatient clinic, Paris, France.
Participants	Individuals who attended hypertension clinic, no entry SBP/DBP defined, 88% (C) 83% (E) on BP lowering drugs. 63% male
Interventions	(1) Booklet with personalised standardised medical information explained to patient and their family doctor. Ten items included on the basis of usefulness of managing hypertension. Patients asked to complete with family doctor and mail carbon copy to outpatient clinic for entry into computerised record. (2) Usual care Patients in both groups encouraged to visit family doctor 1-3 times per trimester according to severity of hypertension
Outcomes	(1) Process of care in terms of use of services. (2) SBP/DBP- (E) 145.1/88.2mmHg versus (C) 146.2/86.8; no difference between groups (3) Other cardiovascular risk factors (smoking, exercise, body weight- no difference between groups. Duration of FU 1 year
Notes	44/82 (54%) of intervention group who were followed up completed personal medical record.
Allocation concealment	B

Study	**Bloom 1979**
Methods	Parallel, individuals based after a work-site screening programme US
Participants	Patients with elevated blood pressure 140/90mmHg. Average age 40, white, male 82%, well educated 60% with a masters degree or higher
Interventions	(1) Educational material about hypertension, reinforced by a hypertension counsellor one week later, designed to improve appointment keeping and knowledge (2) No educational material or counsellor follow up.
Outcomes	(1) Number seeking medical care/appointment- significantly improved 15/27 (E- 55.5%), 7/27 (C- 25.9%) (2) Knowledge about hypertension- increased in (E) 3.22 versus (C) 2.26 Duration of FU 3 months
Notes	RCT concerned with initial follow up of patients identified as having sustained hypertension after screening programme
Allocation concealment	B

Study	**Bogden 1998**
Methods	Parallel, individuals in a single OPD clinic in US

Characteristics of included studies (*Continued*)

Participants	Patients with increased blood pressure, either: 150 or 95mmHg 140 or 90mmHg with CVS risk factors or target organ damage Mean age 55 sd13, 25% mixed Hawiian ancestry, 57% high school graduates, 87% health insurance
Interventions	(1) Pharmacist interacted with physicians and patients: Patients: "Go through medication history "Answered questions "Encouraged compliance Physicians: "Reviewed laboratory data with doctors "Attached "recommendations" about blood pressure treatment Control: usual medical care without pharmacist involvement
Outcomes	(1) % patients with controlled BP (<140 and <90mmHg)- improved 27/49 (E) 9/46 (C) p<0.001 (2) Mean reduction in SBP/DBP at follow up- improved (E) 132/85mmHg versus (C) 145/92mmHg p<0.01 (3) Mean medication cost decreased $6.8 (E) increased $6.5 (C) Duration of FU 16 months
Notes	No contamination between doctors Intervention superior to usual care Process of care in intervention arm. Pharmacist made 162 recommendations to doctors: 10 new (additional) medication to be started 34 medication dose increase 12 stop medication 5 reduce medication due to side effects 16 renew medication at existing dosage 52 switch to a cheaper drug 20 newer more effective drug
Allocation concealment	B

Study	Brook 1983
Methods	Cluster RCT, families unit of randomisation
Participants	2005 Families living in six US cities (47% men, 18% non white, mean age 33.4, range 14-61) Results are reported for subset of hypertensive subjects, 24.7% (n=294) full health insurance, 24.5% (n=562) partial health insurance.
Interventions	(1) Full health insurance- (2) Partial health insurance (three groups at different levels of re-imbusement: (a) Individual - 95% OPD to ceiling of $150, all inpatient (b) Intermediate- 25-50% both OPD and inpatient up to $1000 (c) Catastrophic- 95% both OPD and inpatient up to $1000
Outcomes	(1) Mean DBP- improved by -1.9mmHg (2) Mean SBP- improved by -1.8mmHg (3) General health (4) Health habits (5) Risk of dying Duration of FU: 3 years
Notes	SBP/DBP reported but baseline DBP lower than follow up (see tables 3 and 5 in original report). Subsequent report suggested lower SBP/DBP at follow up adjusted for blood pressure at baseline (see table 2 and text). high losses to FU No details on process of BP care, but free care increased physician contacts and better lifestyle changes Subgroup analysis: Low-income people with high BP had greater improvement than high-income--3.5mmHg (low income) versus 1.1mmHg (high-income)
Allocation concealment	B

Study	Bulpitt 1976
Methods	Parallel, individuals based in 3 hospital hypertension clinics in UK

Characteristics of included studies (*Continued*)

Participants	Intervention directed at hospital physicians (number not stated).
	278 patients with diagnosed hypertension referred to clinics. Characteristics of patients: computer group: 56% female, mean age 51years, mean lying BP 178/105mmHg;
	control group: 53% female, mean age 48 years, mean lying BP 177/106mmHg
Interventions	(1) Computer-held records- allowed doctor to record clinical information in structured format.
	(2) Standard hospital notes
Outcomes	(1) Content of patient record 15 items- overall better recording in computer group
	(2) Length of time of consultation- longer in E (39.9 mins) than C (31.4 mins) at initial consultation, subsequent consultations no difference.
	(3) Patient investigations during RCT- no difference
	(4) Drop outs- 25/136 (E- 18%) 36/142 (C- 25%)
	(4) Average SBP and DBP- no difference (E) 149/96mmHg (C) 149/97mmHg
	Duration of FU 12 months.
Notes	
Allocation concealment	B

Study	**Burrelle 1986**
Methods	Parallel, individuals, hospital outpatients and primary care, USA
Participants	16 treated and non-adherent elderly hypertensive patients, 75% black, 75% women, mean age 69.
Interventions	(1) Home visits, education and special dosing devices; addressed psycho-social problems and compliance problems by means of: medication planners; special dosing devices; individualized instruction on disease states and treatments- Treatment Information on Medications for the Elderly (TIME)
	(2) Usual care
Outcomes	(1) Blood pressure control- no difference between groups, (E) 167.8/89.2mmHg versus (C) 165.8/86.8mmHg
	(2) Compliance (Pill counts and direct questioning, taking >80% of medication)- Percent of pills taken: 92% (E) versus 71% (C) (p<0.001)
	(3) % with controlled hypertension, no difference, (E) 1/8, 13% versus (C) 1/8, 13%
	Duration of FU 8 weeks
Notes	Very small and underpowered study
Allocation concealment	B

Study	**Carnahan 1975**
Methods	Parallel
	Individuals
Participants	V A outpatient clinic US, starting treatment, n=100 (male 98), mean age 54 (E) 57 (C)
Interventions	(1) Self Monitoring, Instructed to use own sphygmomanometer twice a day. Readings recorded and delivered to the clinic when visiting. (2) usual care
Outcomes	(1) Mean SBP/DBP- SBP lower at 6 months FU in (E), 7.5mmHg difference
	DBP no difference at FU
	Duration FU: 6 months
Notes	No SDs available, estimated to be 20mmHg SBP, 10mmHg DBP
Allocation concealment	B

Study	**Coe 1977**
Methods	Parallel, individuals based in 2 hospital hypertension clinics in US

Characteristics of included studies (*Continued***)**

Participants	Hospital physicians (number not stated) 116 patients, 90.5% female, mean age 52years, all black unselected, consecutive referrals to clinics during 6-month period. Characteristics: (1)Mean of 3 separate pretreatment BP measurements >140/95mmHg (2)Three return visits while on treatment (3).BP medication taken as prescribed
Interventions	(1) Computer-generated treatment recommendations by algorithm; generated drug type and dose recommendations to physician (2) Usual physician care
Outcomes	(1) Blood pressure- reported in three strata of DBP, <95, 95-105, >105 but no differences between (E) 152.5/99.6mmHg versus (C) 148.7/96.5mmHg (2) Compliance- self report, no difference (3) Drugs prescribed- patterns of drug use the same. Duration of FU months uncertain but weeks of treatment varied within a range of 21 to 40 weeks
Notes	Difficult to interpret as trial reported on all outcomes by means of initial DBP strata. Mean SBP/DBP was non significantly better in (C) versus (E). Overall conclusion computer generated treatment (E) and usual care by physicians (C) was equivalent.
Allocation concealment	B

Study	**Cummings 1985**
Methods	Hypertensive patients attending in a single urban family practice
Participants	Patients, aged 19 to 96, mean age 60. 62% female, 91% black, 11% newly diagnosed, 75% SBP <140mmHg and DBP >90mmHg
Interventions	(1) Appointment reminder- reminder card sent one week in advance of appointment and telephone patients who missed appointments to schedule new ones (2) Usual care
Outcomes	(1) Appointment keeping rate-appointments improved in (E- 87%) versus (C- 79%). (2) Dropouts from treatment- drop outs less at 4 months in experimental group (E- 87/486, 18%) versus (C- 150/487, 31%) (3) Blood pressure control- average SBP/DBP improved in experimental group(SBP-2mmHg, p=0.18 and DBP -1mmHg, p=0.75) (4) Proportion of patients with controlled hypertension (<140/90)- 31% (E) versus 25% (C) Duration FU 8 months
Notes	
Allocation concealment	B

Study	**Dickinson 1981**
Methods	Factorial, Cluster, RCT
Participants	Four clinical teams in Family Medicine Centre in USA, 4 faculty physicians 37 residents. Each team received on of the interventions. 250 Patients, 69.9% female, mean age 49.6 years, 70.4% white mean weight 78.9kg, mean baseline BP 159/89mmHg. Inclusion criteria: (1) Hypertensive patients visiting practice during 4-month baseline period (2) Elevated systolic or diastolic pressure at last baseline visit (3) At least one visit during 7-month intervention period
Interventions	(1) Computer-generated feedback-monthly feedback reports on individual patients for physician, containing identification, age, date of last visit and latest BP in those with uncontrolled hypertension (age 18-44 >/= 140/90; 45-64 >/=150/95; age >64 >/=160/95) or overdue appointments (2) Education programme- designed to increase physician awareness about non-compliance, plan long term management based on periodic assessment, encourage family, behavioural and drug therapies. Three separate self instructions

Characteristics of included studies (*Continued*)

	(3) Both (4) Neither
Outcomes	1) Follow up appointments increased in interventions-feedback 3.4, education 3.3, both 3.2, control 2.6 NS. (2) Knowledge-significantly improved in physicians who received education only, feedback 76, education 84, both 78, control 74 (3) Blood pressure control- no difference - feedback 145/86mmHg, education 149/85mmHg, both 149/84mmHg, control 148/83 (4) % with controlled hypertension- non significant differences, feeback 65%, education 63%, both 57%, control 58% Duration of FU 7 months.
Notes	Intervention randomised by, directed at physicians, analysis by patient No account taken of clustering. Explains uneven patient numbers per arm of RCT
Allocation concealment	B

Study	Earp 1982
Methods	Parallel Individuals
Participants	Hypertension, taking BP medication that had been initiated, altered or re-started. Based in outpatient hypertension clinic or family practice clinic n=218, mean age 48, 59% female, 77% black
Interventions	(1) Home visits- over 18 months by nurse or pharmacist. Provided a "test of how effectively home-visiting health practitioners could motivate and/or reinforce positive health behaviours, including medication compliance" (2) Home visits plus involvement of "significant other"- involved daily/several times a week BP monitoring (3) Usual care
Outcomes	(1) Home visit group versus usual care: proportion of patients in each group with uncontrolled hypertension (DBP >/=95mmHg)- significant effect at year 2 (E) 21% versus (C) 42%, not significant at year 1 (E) 34% versus (C) 34%. (2) Home visit and involvement of significant other versus usual care; proportion of patients in each group with uncontrolled hypertension (DBP 95mmHg)- non significant effect at year 2 (E) 25% versus (C) 42%, not significant at year 1 (E) 39% versus (C) 34%. Duration of FU: 1 year
Notes	Large proportions lost to follow up at year 2, hence follow up at 1 year when pooling data. Mean number of BP medication taken declined in the two intervention group (1.7 to 1.5 Group 1 and 1.5 to 1.4 Group 2) but increased in control group (Group 3 1.6 to 1.8); between group differences non significant.
Allocation concealment	B

Study	Evans 1986
Methods	Cluster- physicians stratified to solo or group practice and randomly allocated within strata
Participants	Canadian family physicians. Eligible patients, age 30 to 69 years, either DBP >90mmHg at one home visit and taking BP medication or no BP medication and DBP >90mmHg on 3 times at home visits
Interventions	(1) Mailed CME to physicians 14 weekly instalments of information, chart and fu appointment system to encourage detection and recall of patients (2) Usual care
Outcomes	(1) Blood pressure- (DBP<90mmHg, (E) 67% versus (C) 67%, non significant. (2) # visits for BP check- no difference (3) # patients told BP elevated- no difference (4) # patients on BP medication- no difference (5) Mean % compliance rate- no difference (6) % patients with controlled blood pressure- no difference Duration FU 1 year
Notes	Cluster RCT- BP data aggregated at cluster level. No difference found between intervention and usual care, 76% (E) and 79% (C) patients on BP medication.
Allocation concealment	B

Characteristics of included studies (*Continued*)

Study	Fielding 1994
Methods	Parallel, individuals at four work sites in the US
Participants	Patients with increased blood pressure, either: SBP 140 and/or DBP 90mmHg identified during work-site screening. 16%female, 30.5% taking BP lowering durgs
Interventions	(1) IMPACT consisted of monthly 10 minute individual sessions for patients with counsellor at work site that included: "Assessment of current behaviours "Discussion re: treatment goals "Compliance "Mailed monthly package including personalised blood pressure information "Incentives offered e.g. coupons for free sports equipment "Sites were requested to offer at least six classes or demonstrations related to BP control during the year (2) Usual care
Outcomes	(1) Mean SBP/DBP changes- SBP: significantly improved 138.1mmHg (E) versus 144.5mmHg (C) DBP: -no difference 86mmHg (E) versus 86.5mmHg (C) Adjusted difference: SBP 7.6mmHg, p<0.05 DBP 2.4mmHg, NS Duration of FU 1 year
Notes	Statistically significant change for SBP (but not DBP) after adjustment for age, sex and baseline blood pressure A significantly higher proportion of intervention group started BP lowering drugs (E) 13/49, 26.5% (C) 5/52, 9.6%
Allocation concealment	B

Study	Fletcher 1975
Methods	Parallel, individuals based in single emergency room in US
Participants	Patients who attended emergency department with DBP 100mmHg and who had been given a follow up appointment for a medical clinic
Interventions	(1) Reminder (letter or phone) to attend follow up appointment at clinic, offer of assistance if problems arose, followed up until attended clinic or missed two consecutive appointments (2) Usual care
Outcomes	(1) Returned to initial medical clinic appointment significantly improved 62/74 (E- 84%), 44/70 (C- 63%). (2) Blood pressure control the same at FU 38/74 (E- 51%), 37/70 (C- 53%) Duration of FU 5 months
Notes	Improved initial attendance but blood pressure control in both groups the same. Process of care the more vigorous in (E) group but (E- 38%), (C- 33%) said that they were on BP lowering drugs. Blood pressure control defined in age-specific categories 20-39 <140/90 40-59 <150/95 >60 <160/100
Allocation concealment	B

Study	Friedman 1996
Methods	Parallel, individuals from 29 different communities, Boston, USA

Characteristics of included studies (*Continued*)

Participants	Under care of physician for hypertension on BP lowering drugs, SBP >/=160 mmHg or DBP >/= 90mmHg on average two readings. 90% white, 77% female, mean age 76 years
Interventions	(1) Home monitoring and telecommunication system "Weekly automated home blood pressure recording. "Telephone-linked computer system (TLC)- computer-based telecommunications system that converses with patients in their homes, patients contacted weekly. Provides advice concerning their blood pressure, understanding of BP lowering medication, adherence to medication, symptoms that might relate to side effects of therapy. Information directed to patient's physician (2) Usual care
Outcomes	(1) Adherence to medication- improved by 18% (E) vs 12% (C), p=0.03. (2) Mean change in SBP/DBP- no difference for SBP, (E) 158.5mmHg versus (C) 156.4mmHg, p=0.2; significant difference for DBP, (E) 80.9mmHg versus (C) 83.2mmHg, p=0.02; (3) Cost effectiveness- most cost effective for non-adherent patients Duration of FU 6 months.
Notes	Cost effectiveness measured all computer and telecommunication costs, facilities charges, supplies and support personnel for start-up and maintenance of the system. Cost effectiveness ratios were computed for medication adherence improvement and DBP decrease using regression analysis
Allocation concealment	B

Study	Garcia-Pena 2001
Methods	Parallel, individuals, elderly (60) age-stratified sample recruited from 12 family medical centres, Mexico city, Mexico
Participants	Hypertension, mean SBP 160 or/both DBP 90 in untreated patients or treated hypertension patients Mean BP level 161.9/90.8 (C) 162.1/90.9 (E) average age 70.6 years
Interventions	(1) Nurse-based intervention Nurses trained in aging and clinical aspects of hypertension including: "Personal interviews "Health behaviour change models "Process of negotiation "Ethical aspects of home visits On each visit nurse did the following: "Measured BP "Discussed baseline health check and discussed lifestyle changes "Guided patients in healthier lifestyle and negotiated specific targets "Revised pharmacological treatment "Adherence encouraged Frequency of visits 2-4 weeks (2) Usual care from insitute's clinic and mailed pamphlet about hypertension
Outcomes	(1) Blood pressure- mean change SBP 3.31 mmHg p=0.03, mean change DBP 3.67mmHg p<0.001 (2) Weight -1.1 kg significantly reduced (3) Sodium excretion -5.8 ns (4) Control BP <160/90mmHg improved 36.5% (E) versus 6.8% (C) (5) Exercise- slow walking exercise increased (E) 9.1% versus decreased (C) 0.7% (6) Not taking antihypertensive drugs (E) 15.9% versus (C) 26.9% (7) Antihypertensive drug usage- increased in (E) change from baseline12.5% versus (C) 5.3%, difference 7.2% p=0.02 Duration of FU 6 months
Notes	Well conducted RCT. Nurse intervention aimed at both pharmacological and non-pharmacological management of hypertension. Had positive effect on mean SBP/DBP and BP control with increases in number

Characteristics of included studies (*Continued*)

taking antihypertensive medications. Non pharmacological treatment also effective at reducing weight, increasing exercise with non significant reduction in sodium excretion

Allocation concealment	A

Study	Gullion 1987
Methods	Factorial RCT, randomised by physician (n=111), analysed by patient (n=2583), San Francisco USA. Average of 23 patients per practice
Participants	Hypertensive patients using anti-hypertensive medication, had a DBP >90mmHg at some stage of their care. Age range 20-80 years
Interventions	(1) Medical education- "Individualised feedback on medical record information, detailed peer-review "Syllabus material "Educational session by means of telephone call with faculty expert discussing feedback reports and syllabus materials. (2) Behavioural education- "Individualised feedback on patient survey summaries, detailed peer-review "Syllabus material "Educational session, telephone call with faculty expert discussing feedback reports and syllabus materials (3) Both interventions (4) Neither intervention
Outcomes	(1) DBP- no difference between four groups either for mean DBP (85.17, 85.59, 85.16, 85.79 mmHg respectively) or for % with controlled DBP (68.65%, 66.78%, 67.93%, 68.25% respectively) at follow up. (2) Lifestyle outcomes- no difference apart from decreased BMI in behavioural group. (3) Health promotion advice given- more likely to be given advice re: medication regimen, side effects of drugs, sodium intake in behavioural group. Duration of FU 1 year
Notes	Negative RCT with regard to primary outcome of DBP. Caution required with interpretation of lifestyle and health promotion outcomes. Multiple comparisons. DBP reported but not usable because no baseline numbers randomised reported or standard deviations
Allocation concealment	B

Study	Hamilton 1993
Methods	Parallel, individuals based in hypertension clinic in tertiary care teaching medical centre, US
Participants	Thirty four treated hypertensives DBP 90mmHg and/or SBP 160 mmHg, participating in therapeutic hypertension regimen. Mean age 54 years, white, married, high school educated.
Interventions	(1) Postcard reminder one week before the next regularly scheduled appointment, a 30 to 40 min intervention with the nurse practitioner before the appointment with the physician (including tailored care plan, information on hypertension, discussion of risk factors, max. 45 min total time), follow up phone call one month after the intervention to evaluate the negotiated plan of care. (2) Usual care- no self recording
Outcomes	(1) SBP/DBP- improved SBP difference -17.3 mmHg, not DBP -4.7 mmHg, (p=0.03 and 0.22 respectively) (2) Compliance (self report)- no difference, adherence score of 27.5 in intervention group vs 24.5 in control group (p=0.12) (3) Mean number of appointments kept- improved 97% (E) v 74% (C) (p=0.04) (4) Physician rated patient adherence- improved (E), adherence score of 29.18in intervention group vs 23.92 in control group (p=0.005) Duration of FU 6 months

Characteristics of included studies (*Continued*)

Notes	SBP improved, mean number of appointments kept improved in (E) group, adherence no difference on self-report
	Small RCT
Allocation concealment	B

Study	**Hawkins 1979**
Methods	Parallel Individuals
Participants	Medical OPD clinic, San Antonio, US, patients fu for hypertension (42% E) (49% C) and diabetes or both (28% E) (21% C), mean age 61 (E) 60 (C), >90% Mexican Americans, (female 76% E, 78% C)
Interventions	(1) Clinical pharmacist- chronic disease management in OPD setting (medical care monitored by family practice faculty) (2) Usual care by physician
Outcomes	(1) Kept-clinic appointments (2) Compliance with medication (prescription record)- improved diuretic only: 60.5% adherent (E) vs 52.9% (C) (p<0.7), diuretic plus methyldopa: 84.6 % (E) vs 65.4% (C) (p=0.2) (3) Kept OPD appointments- 83.3% (E) vs 73.8% (C) (p<0.0005) (4) Frequency of clinic visit- 6.69 (E) vs 5.38 (C) (p=<0.001) (4) Mean SBP (E) 147mmHg versus 141 (C); p<0.01. Mean DBP 84mHg (E) versus 84mHg (C) non significant. Duration FU 24-29 months
Notes	Improved for pharmacist led care(E) for: (1) Kept OPD appointments (2) Frequency of OPD appointments (3) Mean SBP between group comparison- improved in (E) group but worse for DBP
Allocation concealment	B

Study	**Haynes 1976**
Methods	Parallel Individuals
Participants	Hypertensive males (n=39), not compliant (pill counts <80%) or at goal DBP (90mmHg) after 6 months (previously enrolled in a separate RCT, see Sackett 1975)
Interventions	(1) Patient self monitoring and education, includes: "Home self-measurement of BP "Home BP and medication charting "Tailoring- patients interviewed to improved medication taking "Increased supervision and reinforcement- fortnightly review including positive re-enforcement. All interventions supervised and executed by non health professional programme coordinator (2) Usual care
Outcomes	(1) Compliance- increased in experimental group (E) 65.8 versus (C) 43.2, p=0.025 (2) Control of DBP- increased in experimental group, (E) 93.1mmHg versus (C) 96.4mmHg, p=0.12 (3) Combined compliance and DBP targets- increased in experimental group Duration of FU 1 year.
Notes	(1) No data given- change in DBP and compliance reported (2) Experimental group patients received significantly more attention than control patients (5 hours over 6 months) (3) Physicians treating experimental patients prescribed more vigorously

Characteristics of included studies (*Continued***)**

Allocation concealment	B

Study	**Hetlevik 1998**
Methods	Cluster (29 health centres, 53 family practitioners), analysed by patient (2239 patients). Two regions in Norway.
Participants	Hypertensive patients (baseline BP level given), mean age 64 years, 57% female.
Interventions	(1) Computer based decision support system (CDSS). Doctors and assistants trained and received a user manual. Re-enforcement by means of telephone repetitions seminar on risk intervention and further demonstration of CDSS. (2) Usual care
Outcomes	(1) SBP/DBP- SBP no difference (E) 156.8mmHg versus (C) 155.6mmHg NS, DBP (E) 88.8mmHg versus 89.8mmHg, p<0.05 (2) Cholesterol (3) % smokers (4) BMI (5) Coronary heart disease risk score. All other outcomes no different between groups (6) Recording of risk factor data- improved slightly in (E) group for cholesterol and family history. Duration of FU 24 months.
Notes	Only 104 (11%) patients had CDSS used on them during trial period.
Allocation concealment	B

Study	**Hetlevik 1999**
Methods	Cluster (29 health centres, 53 family practitioners), analysed by patient (2239 patients). Two regions in Norway.
Participants	Hypertensive patients (baseline BP level given), mean age 64 years, 57% female.
Interventions	(1) Computer based decision support system (CDSS). Doctors and assistants trained and received a user manuel. Re-enforcement by means of telephone repetitions seminar on risk intervention and further demonstration of CDSS. (2) Usual care
Outcomes	(1) SBP/DBP- SBP (E) 156.8mmHg versus (C) 155.6mmHg NS, DBP (E) 88.8mmHg versus 89.8mmHg, p<0.05 (2) Cholesterol (3) % smokers (4) BMI (5) Coronary heart disease risk score. All other outcomes no different between groups (6) Recording of risk factor data- improved slightly in (E) group for cholesterol and family history. Duration of FU 24 months.
Notes	Only 104 (11%) patients had CDSS used on them during trial period. No account for clustering reported in the analysis section
Allocation concealment	B

Study	**Hypertension 1979**
Methods	Patients identified at 14 "HDFP centres throughout the US (13 by residential area- census tract, probability sample of larger areas, entire housing projects or in one centre by employment roll of industries). Randomisation at the patient level after initial screening. Initially screened for DBP, 2 stage process: (1) All 158,096 screened (89% of all age-eligible patients), if average DBP was 95mmHg invited for second screen at clinic, regardless of whether taking BP lowering drugs or not. (2) If mean DBP 90mmHg, patient eligible and randomised. 10,940 agreed to randomisation Randomisation stratified according to entry DBP and HDFP centre: (1) Stratum i- 90-104 mmHg, n= 7,825 (71.5%) (2) Stratum ii- 105-114 mmHg, n=2,052 (18.8%) (3) Stratum iii- 115 mmHg, n=1,063 (9.7%) No SBP entry criteria and no upper limits of BP

Characteristics of included studies (*Continued*)

	11,386 persons randomised but 446 subsequently excluded due to randomisation error that occurred at one clinic
Participants	Inclusion criteria: (1) Men and women age 30 to 69 years (2) Average home screening DBP 95mmHg (3) Confirmed follow up DBP 90mmHg Exclusion criteria: (1) Terminally ill (2) Institutionalised 10,940 randomised, 54% male, 45% black Antihypertensive drugs taken at start of RCT: SC (26.3%), RC (25.7%)
Interventions	(1) Stepped care (SC), designed to provide rigorous, systematic, antihypertensive drug treatment by means of: "Free care- visits, drugs, investigations, transport "Emphasis placed on clinic attendance and compliance- pill counts used "Convenience- low waiting times, parmedical personnel, physician on call "Stepped drug treatment according to BP response "Patients seen at intervals determined by their clinical status, at least every 4 months, and generally every 2 months (2) Referred care (RC): referred to their "primary sources of care, usually own physicians. All SC (E) and RC (C) participants seen at home at years 1, 2, 4 and 5 for health history and BP measurement and at the clinic at years 2 and 5 for an examination. At each contact each RC participant was advised to visit a physician. If severe hypertension (DBP 115mmHg or end organ damage) special steps were taken to achieve contact with a physician.
Outcomes	(1) # (%) on antihypertensive medication- higher for SC 81.2%, compared to RC 64.2% by year 5. (2) SBP/DBP level- lower for SC (130/84mmHg) vs RC (140/89) at 5 year FU (3) % controlled blood pressure (HDFP goal)- improved SC versus RC. (4) All cause mortality- significantly better 350/5485 (6.38%) vs 421/5455 (7.78%) All outcomes apply across 3 strata of entry DBP. Most of BP reduction occurred by end of year 1 Duration FU 1 and 5 years (mortality)
Notes	Data reported in 3 strata of entry DBP At one year 84.4% (SC) versus 59.1% (RC) taking antihypertensive medication Step 1- 32.7% v 12.1% Step 2- 23.6% v 16% Step 3- 3.3% v 2.3% Step 4- 2% v 2% Total drug status known at 1 year, 82.4% SC v 82.8% RC Intensity of BP medication in SC at 5 years: 42% taking single drug- step 1, 27% taking two drugs- step 2, 9% taking 3 drugs- step 3, 11% taking 4 or more drugs, step 4and 5 at 5 years HDFP defined goal DBP as 90mmHg for those entering with DBP 100mmHg or receiving antihypertensive therapy and a 10mmHg decrease for those entering with DBP of 90-99mmHg. Mortality FU 5 years, mean BP data reported at 1 year and 5 years
Allocation concealment	A

Study	**Hypertension 1979a**
Methods	Patients identified at 14 "HDFP centres throughout the US (13 by residential area- census tract, probability sample of larger areas, entire housing projects or in one centre by employment roll of industries). Randomisation at the patient level after initial screening. Initially screened for DBP, 2 stage process: (1) All 158,096 screened (89% of all age-eligible patients), if average DBP was 95mmHg invited for second screen at clinic, regardless of whether taking BP lowering drugs or not. (2) If mean DBP 90 mmHg, patient eligible and randomised. 10,940 agreed to randomisation Randomisation stratified according to entry DBP and HDFP centre:

Characteristics of included studies (*Continued*)

(1) Stratum i- 90-104 mmHg, n= 7,825 (71.5%)
(2) Stratum ii- 105-114 mmHg, n=2,052 (18.8%)
(3) Stratum iii- 115 mmHg, n=1,063 (9.7%)

No SBP entry criteria and no upper limits of BP

11,386 persons randomised but 446 subsequently excluded due to randomisation error that occurred at one clinic

Participants	Inclusion criteria: (1) Men and women age 30 to 69 years (2) Average home screening DBP 95mmHg (3) Confirmed follow up DBP 90mmHg Exclusion criteria: (1) Terminally ill (2) Institutionalised 10,940 randomised, 54% male, 45% black Antihypertensive drugs taken at start of RCT: SC (26.3%), RC (25.7%)
Interventions	(1) Stepped care (SC), designed to provide rigorous, systematic, antihypertensive drug treatment by means of: "Free care- visits, drugs, investigations, transport "Emphasis placed on clinic attendance and compliance- pill counts used "Convenience- low waiting times, parmedical personnel, physician on call "Stepped drug treatment according to BP response "Patients seen at intervals determined by their clinical status, at least every 4 months, and generally every 2 months (2) Referred care (RC): referred to their "primary sources of care, usually own physicians. All SC (E) and RC (C) participants seen at home at years 1, 2, 4 and 5 for health history and BP measurement and at the clinic at years 2 and 5 for an examination. At each contact each RC participant was advised to visit a physician. If severe hypertension (DBP 115 mmHg or end organ damage) special steps were taken to achieve contact with a physician.
Outcomes	(1) # (%) on antihypertensive medication- higher for SC 81.2%, compared to RC 64.2% by year 5. (2) SBP/DBP level- lower for SC (130/84mmHg) vs RC (140/89) at 5 year FU (3) % controlled blood pressure (HDFP goal)- improved SC versus RC. (4) All cause mortality- significantly better 350/5485 (6.38%) vs 421/5455 (7.78%) All outcomes apply across 3 strata of entry DBP. Most of BP reduction occurred by end of year 1 Duration FU 1 and 5 years (mortality)
Notes	Data reported in 3 strata of entry DBP At one year 84.4% (SC) versus 59.1% (RC) taking antihypertensive medication Step 1- 32.7% v 12.1% Step 2- 23.6% v 16% Step 3- 3.3% v 2.3% Step 4- 2% v 2% Total drug status known at 1 year, 82.4% SC v 82.8% RC Intensity of BP medication in SC at 5 years: 42% taking single drug- step 1, 27% taking two drugs- step 2, 9% taking 3 drugs- step 3, 11% taking 4 or more drugs, step 4and 5 at 5 years HDFP defined goal DBP as 90 mmHg for those entering with DBP >100 mmHg or receiving antihypertensive therapy and a 10 mmHg decrease for those entering with DBP of 90-99mmHg. Mortality FU 5 years, mean BP data reported at 1 year and 5 years

Characteristics of included studies (*Continued*)

Allocation concealment   A

Study	Hypertension 1982
Methods	Patients identified at 14 "HDFP centres throughout the US (13 by residential area- census tract, probability sample of larger areas, entire housing projects or in one centre by employment roll of industries). Randomisation at the patient level after initial screening. Initially screened for DBP, 2 stage process: (1) All 158,096 screened (89% of all age-eligible patients), if average DBP was 95mmHg invited for second screen at clinic, regardless of whether taking BP lowering drugs or not. (2) If mean DBP 90mmHg, patient eligible and randomised. 10,940 agreed to randomisation Randomisation stratified according to entry DBP and HDFP centre: (1) Stratum i- 90-104 mmHg, n= 7,825 (71.5%) (2) Stratum ii- 105-114 mmHg, n=2,052 (18.8%) (3) Stratum iii- 115 mmHg, n=1,063 (9.7%) No SBP entry criteria and no upper limits of BP 11,386 persons randomised but 446 subsequently excluded due to randomisation error that occurred at one clinic
Participants	Inclusion criteria: (1) Men and women age 30 to 69 years (2) Average home screening DBP 95mmHg (3) Confirmed follow up DBP 90mmHg Exclusion criteria: (1) Terminally ill (2) Institutionalised 10,940 randomised, 54% male, 45% black Antihypertensive drugs taken at start of RCT: SC (26.3%), RC (25.7%)
Interventions	(1) Stepped care (SC), designed to provide rigorous, systematic, antihypertensive drug treatment by means of: "Free care- visits, drugs, investigations, transport "Emphasis placed on clinic attendance and compliance- pill counts used "Convenience- low waiting times, parmedical personnel, physician on call "Stepped drug treatment according to BP response "Patients seen at intervals determined by their clinical status, at least every 4 months, and generally every 2 months (2) Referred care (RC): referred to their "primary sources of care, usually own physicians. All SC (E) and RC (C) participants seen at home at years 1, 2, 4 and 5 for health history and BP measurement and at the clinic at years 2 and 5 for an examination. At each contact each RC participant was advised to visit a physician. If severe hypertension (DBP 115mmHg or end organ damage) special steps were taken to achieve contact with a physician.
Outcomes	(1) # (%) on antihypertensive medication- higher for SC 81.2%, compared to RC 64.2% by year 5. (2) SBP/DBP level- lower for SC (130/84mmHg) vs RC (140/89) at 5 year FU (3) % controlled blood pressure (HDFP goal)- improved SC versus RC. (4) All cause mortality- significantly better 350/5485 (6.38%) vs 421/5455 (7.78%) All outcomes apply across 3 strata of entry DBP. Most of BP reduction occurred by end of year 1 Duration FU 1 and 5 years (mortality)
Notes	Data reported in 3 strata of entry DBP At one year 84.4% (SC) versus 59.1% (RC) taking antihypertensive medication Step 1- 32.7% v 12.1%

Characteristics of included studies (*Continued*)

Step 2- 23.6% v 16%

Step 3- 3.3% v 2.3%

Step 4- 2% v 2%

Total drug status known at 1 year, 82.4% SC v 82.8% RC

Intensity of BP medication in SC at 5 years: 42% taking single drug- step 1, 27% taking two drugs- step 2, 9% taking 3 drugs- step 3, 11% taking 4 or more drugs, step 4and 5 at 5 years

HDFP defined goal DBP as 90mmHg for those entering with DBP 100mmHg or receiving antihypertensive therapy and a 10mmHg decrease for those entering with DBP of 90-99mmHg.

Mortality FU 5 years, mean BP data reported at 1 year and 5 years

Allocation concealment	A

Study	Hypertension 1986
Methods	Patients identified at 14 "HDFP centres throughout the US (13 by residential area- census tract, probability sample of larger areas, entire housing projects or in one centre by employment roll of industries). Randomisation at the patient level after initial screening. Initially screened for DBP, 2 stage process: (1) All 158,096 screened (89% of all age-eligible patients), if average DBP was 95mmHg invited for second screen at clinic, regardless of whether taking BP lowering drugs or not. (2) If mean DBP 90mmHg, patient eligible and randomised. 10,940 agreed to randomisation Randomisation stratified according to entry DBP and HDFP centre: (1) Stratum i- 90-104 mmHg, n= 7,825 (71.5%) (2) Stratum ii- 105-114 mmHg, n=2,052 (18.8%) (3) Stratum iii- 115 mmHg, n=1,063 (9.7%) No SBP entry criteria and no upper limits of BP 11,386 persons randomised but 446 subsequently excluded due to randomisation error that occurred at one clinic
Participants	Inclusion criteria: (1) Men and women age 30 to 69 years (2) Average home screening DBP 95mmHg (3) Confirmed follow up DBP 90mmHg Exclusion criteria: (1) Terminally ill (2) Institutionalised 10,940 randomised, 54% male, 45% black Antihypertensive drugs taken at start of RCT: SC (26.3%), RC (25.7%)
Interventions	(1) Stepped care (SC), designed to provide rigorous, systematic, antihypertensive drug treatment by means of: "Free care- visits, drugs, investigations, transport "Emphasis placed on clinic attendance and compliance- pill counts used "Convenience- low waiting times, parmedical personnel, physician on call "Stepped drug treatment according to BP response "Patients seen at intervals determined by their clinical status, at least every 4 months, and generally every 2 months (2) Referred care (RC): referred to their "primary sources of care, usually own physicians. All SC (E) and RC (C) participants seen at home at years 1, 2, 4 and 5 for health history and BP measurement and at the clinic at years 2 and 5 for an examination. At each contact each RC participant was advised to visit a physician. If severe hypertension (DBP 115mmHg or end organ damage) special steps were taken to achieve contact with a physician.

Characteristics of included studies (*Continued*)

Outcomes	(1) # (%) on antihypertensive medication- higher for SC 81.2%, compared to RC 64.2% by year 5. (2) SBP/DBP level- lower for SC (130/84mmHg) vs RC (140/89) at 5 year FU (3) % controlled blood pressure (HDFP goal)- improved SC versus RC. (4) All cause mortality- significantly better 350/5485 (6.38%) vs 421/5455 (7.78%) All outcomes apply across 3 strata of entry DBP. Most of BP reduction occurred by end of year 1 Duration FU 1 and 5 years (mortality)
Notes	Data reported in 3 strata of entry DBP At one year 84.4% (SC) versus 59.1% (RC) taking antihypertensive medication Step 1- 32.7% v 12.1% Step 2- 23.6% v 16% Step 3- 3.3% v 2.3% Step 4- 2% v 2% Total drug status known at 1 year, 82.4% SC v 82.8% RC Intensity of BP medication in SC at 5 years: 42% taking single drug- step 1, 27% taking two drugs- step 2, 9% taking 3 drugs- step 3, 11% taking 4 or more drugs, step 4and 5 at 5 years HDFP defined goal DBP as 90mmHg for those entering with DBP 100mmHg or receiving antihypertensive therapy and a 10mmHg decrease for those entering with DBP of 90-99mmHg. Mortality FU 5 years, mean BP data reported at 1 year and 5 years
Allocation concealment	A

Study	**Jewell 1988**
Methods	Hypertensive patients in a single practice in the UK
Participants	Patients aged 30-64 years. Newly diagnosed: raised DBP >100mmHg aged 30-39, >105mmHg aged >40 Previously diagnosed: DBP >95mmHg on 3 measurements at a single visit
Interventions	(1) Nurse-led clinic. Agreed protocol determined treatment and frequency of attendance in both groups. Target was to reduce DBP <90mmHg, 15 minute consultation. Note: both nurse led and doctor led care was by means of identical protocol. (2) Usual care-general practitioner 10 minute consultation
Outcomes	(1) Mean SBP/DBP- between group difference in mean SBP -0.8mmHg (-8.7 to 24.7) NS, DBP - 0.4mmHg (-6.2 to 7) NS. (2) Proportion with DBP <90mmHg 10/15 (E- 67%) 12/19 (C- 63%) (3) Quality of data recording (better in nurse group for pulse, weight, urine testing) (4) Frequency of attendance (no difference, mean annual rates 5.7 (C) 6 (E) groups. (5) Knowledge of medication (no difference) (6) Reactions to the service (no difference) Duration FU 1 year
Notes	
Allocation concealment	B

Study	**Johnson 1978**
Methods	Factorial RCT, randomised at individual level, stratified by age and sex.

Characteristics of included studies (*Continued*)

Participants	Screenees from a Canadian shopping centre, n=140 (male 82), age 35-65 years All taking BP lowering medication for 1 year with uncontrolled hypertension (DBP 95mmHg)
Interventions	(1) Self recording- given BP recording device, take BP daily and take charts with BP records to their physician (2) Home visits- BP measured in their homes every 4 weeks with result given to them and physician. Both groups visited at home after 2 weeks (3) Both interventions (4) Neither intervention
Outcomes	(1) Changes in mean DBP- no difference (2) Changes in mean compliance- no difference. (3) Changes mean compliance in those with initial compliance <80%- no difference (4) Change mean DBP in those with initial problems remembering to take BP medication- subgroup effect in initially difficult to remember group (5) Change in strength in therapy- no difference Duration of FU 6 months
Notes	More "explanatory" RCT, follow on from Haynes. In contrast to positive findings in Haynes RCT, this RCT proved to be negative. Main difference in this RCT is that home visitors dealt with only measurement of BP, no attempts made to influence medication taking. No standardised treatment regimen or goal BP advocated to treating physicians
Allocation concealment	B

Study	**Krieger 1999**
Methods	Parallel, individuals in a single "low income" area of Seattle, USA
Participants	Hypertensive patients (entry SBP 140mmHg or DBP 90mmHg). 4761 had BP measured, 759 (15.9%) eligible, 421 (55.5%) participated. Overall, 40% taking BP lowering medication, 79% black, 66% below federal poverty level, 33% BP 160/100mmHg. All participants paid $25 for completing study
Interventions	(1) Outreach and tracking by community health worker. Provided: referral to medical care and assistance with finding a provider; ensure appointment with health worker; appointment reminder letter; follow up patient (up to 3 times) to see if appointment kept; new appointment if one missed (up to 3 times); assistance to reduce barriers to care including transport, child care or other services (2) Usual care
Outcomes	(1) Follow up appointment within 90 days- (E) 95/146 (65.1%) versus (C) 77/165 (46.7%). (2) SBP/DBP-improved SBP (E) 139.4mmHg versus (C) 141mmHg, DBP no difference (E) 84.6mmHg versus (C) 84.3mmHg Duration of FU 3 months.
Notes	Study designed to assess follow up within 30 days. Large differential loss to follow up (greater in intervention arm). Mean SBP/DBP data provided by authors of study No intention to treat analysis.
Allocation concealment	B

Study	**Levine 1979**
Methods	Factorial trial with 8 groups of various combinations of the 3 interventions and control individuals at two hypertension clinics in US
Participants	91% black, median age 54 years, 70% female, low income ($45250 median yearly income). BP (mmHg) entry criteria based on age: 20-39: >140/90 40-59: >150/95 60: 160/100

Characteristics of included studies (*Continued*)

Interventions	(1) Three interventions: "Exit interview- individualised 5-10 minute counselling session, explaining and re-inforcing instructions to the patient "Instructional session with adult at home concerning adherence and follow up care "Group sessions- three, one hour sessions led by social worker "Seven experimental groups and one control group (2) Usual care with none of above interventions
Outcomes	(1) Deviation in weight from ideal weight- significantly better in patients who received all 3 interventions compared to those who received none (2) Appointment keeping (ratio of kept/scheduled)- improved in group who received all 3 interventions versus control at 2 yrs (E) .68 versus (C) .63; no difference at 5 yrs (E) .95 versus (C) .83 (3) Adherence to drug therapy- all improved, greatest in 3 intervention arm versus control (53% vs 40%) (4) % patients with controlled BP - increased at 2 years (E) 52% versus (C) 42%; 5 years (E) 66% versus (C) 56%. Significantly better in four intervention groups compared to control at 5 years (5) All cause mortality- cumulative mortality better in all experimental groups combined (12.9) compared to control group (30.2) (6) Cost effectiveness- multiple interventions appear more effective, not necessarily more cost effective. Authors feel that may be better to use single interventions depending on setting and financial constraints{821} Duration of FU 2 and 5 years.
Notes	Multiple comparisons in results section: 7 intervention arms and one control group In addition no a priori sub-group analysis Blood pressure control age-specific categories <40 <140/90, 40-59 <150/95 60, <160/100 Substantially greater numbers lost to follow up in (C) arm at 2 and 5 years
Allocation concealment	D

Study	Logan 1979
Methods	Parallel Individuals
Participants	Volunteers from business settings with newly diagnosed hypertension (DBP 95mmHg, or DBP 91-94mmHg and SBP >140mmHg)
Interventions	(1) Work-site care- nurse management according to a standard protocol- including drug regimen and regular review, once monthly if BP not controlled (2) Usual care from their own family physicians
Outcomes	(1) # patients taking BP treatment- increased in Experimental group (177/206, 86% vs 108/204, 53%) (2) Mean DBP- improved in (E) 94.3mmHg versus (C) 90.3mmHg, p<0.01. (3) Reach goal DBP- 50% (E) versus 28.9% (C). (4) Compliance-better in experimental group (67.6% vs 49.1%) Duration of FU 6 months
Notes	Goal DBP <90mmHg if entry DBP >95mmHg; or <6mmHg in those with entry DBP 95mmHg or less.
Allocation concealment	B

Study	Martinez-Amenos 1990
Methods	Parallel Individuals

Characteristics of included studies (*Continued*)

Participants	Hypertension Registry from 19 primary care centres in Spain. Mean age 61 years, 59% female Initial volunteers asked if they wished to participate; those agreeing were randomised and labelled "motivated" group; group who declined to participate also followed up "non motivated"
Interventions	(1) Individual education- comments and explanations to errors encountered in answers to baseline knowledge questionnaire (2) Team education- 2 talks given by nurses or doctors with AV material to 8-12 patients (3) Control group
Outcomes	(1) Proportion of patients in each group with uncontrolled hypertension (SBP <160, DBP <95mmHg)- within group increase reported for both intervention arms, individual 50.4% to 60.9%, team, 55.8% to 68.8%, non significant within group change in control group, 54.4% to 58.9% (2) Patient knowledge- no between group difference, individual 19.79, Team 20.58, control 19.78 Duration of FU: 2 months
Notes	Knowledge increased within all 3 groups over time, between group comparison not statistically tested No baseline numbers per arm of study reported % control BP not included in meta-analysis as no denominator data available at start of RCT
Allocation concealment	B

Study	**McAlister 1986**
Methods	Cluster (60 doctors initially, 10 dropped out), parallel, Toronto Canada
Participants	N=50 general practitioners, 1241 (E) 990 (C), hypertensive patients with one of the following: (1) DBP >90 mmHg on treatment (2) DBP >104 mmHg not on treatment (3) DBP >90 or <105 mmHg unless evidence of complications or risk factors (4) Newly detected patients with "high blood pressure" detected during the trial
Interventions	(1) Computer generated feedback to physician: "Cumulative chart of patient's DBP "Inter and Intra practice DBP ranking "Commentary on treatment by GP according to a "stepped care" approach (2) Control group filled out same forms but no feedback given
Outcomes	1)Workload: GPs in experimental group saw more patients (2) Mean score on length of follow up: better in intervention 199.3 days (E) vs 167days (C) (3) Drop outs: 37.5% (E) vs 42.1% (C) (4) In all patients DBP reading in those with initial DBP > 104mmHg: 88.5mmHg (E) vs 93.3mmHg (C), net DBP change 0.8mmHg P <0.1 (5) % patients with controlled DBP (90mmHg)- 88.9% (E) versus 87.5% (C) NS (6) # days with sustained DBP control 323 (E) vs 259(C) (7) # times visited GP: 13.3 (E) vs (17.4) Duration 16 months
Notes	Multiple outcomes reported, some favourable for experimental arm- saw more patients who were less likely to drop out of care. Doesn't appear to have had an impact on overall DBP control but other measures of BP control favoured intervention group such as number of days with sustained DBP control. This was achieved with fewer visits in the intervention group
Allocation concealment	B

Study	**Mehos 2000**
Methods	Parallel, individuals in a single family medicine clinic, US

Characteristics of included studies (*Continued*)

Participants	41 uncontrolled hypertensives, SBP 140-179mmHg and/or DBP 90-109mmHg, currently on treatment, mean age 59 years, 70% women
Interventions	(1) Home blood pressure monitoring, diary and instruction to measure blood pressure, information on hypertension and risk factors, subsequent evaluation by clinical pharmacist (2) Usual care
Outcomes	(1) SBP, DBP and mean BP- all reduced in (E) group, SBP (E) 140.8mmHg versus (C) 146.9mmHg (p= 0.069), DBP (E) 80.6mmHg versus (C) 85.6mmHg (p=0.02), (2) Compliance (self report)- mean adherence 82% (E) vs 89% (C) (p=0.29) (3) Drug alteration (dosage increase, addition or switch)- 83% (E) vs 33% (C) (p=0.29) (4) Quality of life (SF36)- no difference between groups Duration of FU 6 months
Notes	
Allocation concealment	B

Study	Midanik 1991
Methods	Parallel, individuals, from a single foundation health plan in California, US.
Participants	204 untreated hypertensive patients with "mild" hypertension- SBP <180mmHg and DBP 90-99mmHg
Interventions	(1) Self monitoring- patients trained to take two consecutive readings twice a week. Sent in readings every 4 weeks for one year (2) Usual care
Outcomes	(1) Blood pressure- mean change SBP -1 mmHg, mean change DBP -1 mmHg (E) versus mean change SBP +1 mmHg, mean change DBP -1 mmHg Duration of FU 1 year
Notes	Untreated subjects with 18% of (E) and 17% of (C) patients taking antihypertensive medication at the end of the RCT
Allocation concealment	B

Study	Montgomery 2000
Methods	27 general practice in UK, Cluster RCT, patients on register
Participants	Hypertensive patients aged 60-80 taking BP lowering drugs. Randomly selected from practice register
Interventions	(1) Computer based decision support system (CDSS) (2) Risk chart Both interventions provided health professional (general practitioner or practice nurse) with explicit cardio-vascular risk. Based on New Zealand hypertension guidelines. (3) Usual care
Outcomes	(1) Cardiovascular risk- no change in CVD risk between 3 groups (2) SBP/DBP- adjusted analysis, chart group had better mean SBP reading than usual care (difference 4.6mmHg) (3) Proportion of patients with controlled hypertension (<160/90)- no difference between two intervention groups chart 39.7%, CDSS 47.5% and control 40.7% (4) Medication change- intensity of BP medication prescribing greater in chart group compared to usual care Duration of FU 1 year
Notes	
Allocation concealment	A

Study	Morisky 1983
Methods	Factorial trial with 8 groups of various combinations of the 3 interventions and control individuals at two hypertension clinics in US

Characteristics of included studies (*Continued***)**

Participants	91% black, median age 54 years, 70% female, low income ($45250 median yearly income). BP (mmHg) entry criteria based on age: 20-39: >140/90 40-59: >150/95 60: 160/100
Interventions	(1) Three interventions: "Exit interview- individualised 5-10 minute counselling session, explaining and re-inforcing instructions to the patient "Instructional session with adult at home concerning adherence and follow up care "Group sessions- three, one hour sessions led by social worker "Seven experimental groups and one control group (2) Usual care with none of above interventions
Outcomes	(1) Deviation in weight from ideal weight- significantly better in patients who received all 3 interventions compared to those who received none (2) Appointment keeping (ratio of kept/scheduled)- improved in group who received all 3 interventions versus control at 2 yrs (E) .68 versus (C) .63; no difference at 5 yrs (E) .95 versus (C) .83 (3) Adherence to drug therapy- all improved, greatest in 3 intervention arm versus control (53% vs 40%) (4) % patients with controlled BP - increased at 2 years (E) 52% versus (C) 42%; 5 years (E) 66% versus (C) 56%. Significantly better in four intervention groups compared to control at 5 years (5) All cause mortality- cumulative mortality better in all experimental groups combined (12.9) compared to control group (30.2) (6) Cost effectiveness- multiple interventions appear more effective, not necessarily more cost effective. Authors feel that may be better to use single interventions depending on setting and financial constraints{821} Duration of FU 2 and 5 years.
Notes	Multiple comparisons in results section: 7 intervention arms and one control group In addition no a priori sub-group analysis Blood pressure control age-specific categories <40 <140/90, 40-59 <150/95 60, <160/100 Substantially greater numbers lost to follow up in (C) arm at 2 and 5 years
Allocation concealment	B

Study	**Muhlhauser 1993**
Methods	10 general practices Germany, 20 hypertensive patients randomly selected (age 30-60 years)
Participants	Hypertension (mean last 2 measurements 160 and/or 95). Taking BP medication (E 77%, C 86%)
Interventions	(1) Hypertension treatment and teaching programme (HTTP) consisted of: "Four consecutive meetings lasting 60-90 mins in groups of 4-6. "Provided by physician assistants "Responsibility including BP self monitoring "Confirming diagnosis and treatment by using home BP measurements "Emphasis on non-pharmacological treatment Doctors (8 hours) and assistants (20 hours) in intervention practices attended preparatory course but RCT aimed principally at patients (2) Usual care
Outcomes	(1) Change in SBP/DBP- significantly improved at follow up, difference SBP 5mmHg, DBP 4mmHg (2) Proportion of patients with controlled hypertension (<140/90)- no difference (E) 14% versus 15% (C) (3) # BP drugs taken

Characteristics of included studies (*Continued*)

	Duration of FU 18 months
Notes	(1) Only 46 (46%) in intervention group received intervention (2) Cluster RCT not accounted for design or analysis.
	(3) Well conducted RCT but differential losses to FU
	(4) Less people in intervention group taking BP medication at end of RCT (mean # (E)- 1.2, (C) 1.8)
Allocation concealment	B

Study	New 2004
Methods	Cluster RCT General practices
Participants	44 general practices, Salford, UK, 10303 participants
Interventions	(1) Educational outreach: specialist nurses arranged a schedule of visits with general practitioners and practice nurses, reminding them of protocols and clinical targets; provided educational material and protocols used in secondary care for nurse and doctor interventions including stepping up pharmacotherapy when necessary.
	(2) usual care
Outcomes	(1) Proportion of participants reaching blood pressure target/OR: no difference between groups OR 1.01 (95% CI 0.8 to 1.3, p=0.93).
Notes	Study funded by pharmaceutical company.
Allocation concealment	B

Study	Ornstein 2004
Methods	Cluster RCT, 20 community-based family or general internal medicine practices in 14 US states. 44 physicians, 17 "midlevel" providers and approximately 200 staff members
Participants	Of 87,291 patients from 20 practices, 7772 (8.9%) with hypertension. At baseline 40% (E) and 43.7% (C) had "controlled" blood pressure (<140/90).
	21 study indicators included:
	-Hypertension (5) including most recent BP measurement <140/90 for patients with a diagnosis of hypertension
	-Hyperlipidemia (2)
	-Coronary heart disease (6)
	"Heart failure (1)
	-Atrial fibrillation (1)
	-Diabetes (6)
Interventions	(1) Multi-method quality improvement (QI)-
	-Practice site visits (6-7, 1-2 day site visits in a two year period) involving physicians and pharmacist with expertise in academic detailing. Healthcare providers encouraged to use (QI) tools
	-Two-day network meetings in each study year. Initial meeting directed at lead clinician with "best practice" presentations made by participating clinicians who were performing well. Clinical and administrative staff attended second meeting
	(2) Usual care- received copies of practice guidelines and quarterly performance reports
Outcomes	(1) Control BP <140/90mmHg improved 58.4% (E) versus 51.9% (C), adjusted difference 8.0 (0.0 to 16.0), p=0.047
	Duration of FU 2 years
Notes	General multi-method across 6 conditions and 21 quality indicators. Overall intervention practices improved 22.4 percentage points in terms of indicators at or above target, compared to 16.4 in control practices, difference 6.0 percentage points (p>0.2).
	Patients in intervention practices had greater improvements than control practices for diagnosis of hypertension and blood pressure control

Characteristics of included studies (*Continued*)

Allocation concealment	B

Study	**Park 1996**
Methods	Parallel, individuals two pharmacies, US
Participants	Taking BP lowering treatment or had BP 140/90 mmHg. mainly white treated hypertensives, 50% women, mean age 60 years
Interventions	(1) Pharmacist administered monthly patient management including education, medication changes, verbal counselling and written information on hypertension and risk factors (2) Traditional pharmacy services
Outcomes	(1) SBP/DBP- improved SBP (E) 143.2mmHg versus (C) 148.6mmHg, DBP (E) 83.2mmHg versus (C) 83.7mmHg, no between group p values reported (2) Control of blood pressure (<140/90 mmHg)- improved 52.2% (E) vs 17.4% (C), p<0.02 (3) Compliance (pill counts, unaware)- mean adherence 86.8% (E) vs 89.1% (C) no p value reported (4) Self reported quality of life- in general higher in (E) vs (C) group (5) Time spent with patient- higher in (E) group, particularly at first visit Duration of FU 4 months
Notes	
Allocation concealment	B

Study	**Pierce 1984**
Methods	Factorial, individuals, single general practice clinic, Western Australia
Participants	Uncontrolled hypertensives (SBP 160 and/or DBP 95) taking BP medication, mean age 57 years, 60% women,
Interventions	(1) Self monitoring of blood pressure: 30 min briefing, monthly recording chart (2) Health education programme promoting a healthy cardiovascular lifestyle: four meetings, 90 min duration, max 12 participants, encouraged to make action goals, information (risk factors for heart disease, stress, diet) (3) Both interventions (4) Usual care
Outcomes	(1) Blood pressure control- Education: 83% (E) vs 67% (C) (p<0.05, effect size unclear) p<0.05 Monitoring: 74% (E) vs 78% (C) NS (2) Compliance (pill count, self report)- No significant difference between groups: Education: 27% good adherers versus 24% in control group. Monitoring: 30% Both interventions: 26% (3) Patient Knowledge- no difference Duration of FU 12 months
Notes	Health education appears more beneficial in controlled blood pressure than self monitoring. Blood pressure reduction, target blood pressure level not defined
Allocation concealment	B

Study	**Robson 1989**
Methods	Parallel, individuals based in a single family practice in UK
Participants	Patients registered in the practice. Age 30-64. Also concerned with recording and follow up of other cardiovascular risk factor data and cervical screening follow up
Interventions	(1) Recording and follow up of blood pressure and other cardiovascular risk factors with practice nurse or general practitioner aided by computer

Characteristics of included studies (*Continued*)

	(2) Usual general practitioners follow up
Outcomes	(1) Blood pressure recording in all patients- increased 1511/1620 (E- 93%) 1160/1586 (C- 73%)
	(2) Blood pressure recording in hypertensive patients- increased 104/107 (E- 97%) 90/116 (C- 69%)
	(3) Other cardiovascular risk factors- all increased recording in intervention group, smoking, family history and cholesterol
	Duration of FU 2 years
Notes	Improved recording of blood pressure and other cardiovascular risk factors
Allocation concealment	B

Study	**Roca-Cusachs 1991**
Methods	Parallel, individual in a hypertension clinic, Spain
Participants	Newly diagnosed hypertensive patients (excluded age >70, illiterate and "high probability of non attendance") Entry SBP/DBP noted but no threshold required for eligibility. Mean values were:
	(E) 156.3/95.8
	(C) 160.3/96.1
Interventions	(1)Patient education-
	"Booklet at initial entry into study
	"Two educational talks. First educational talk given by pharmacist and doctor, covered information about hypertension, treatment adherence and appointments; second educational talk given by dieticians covered non-pharmacological treatments.
	"Personal tutorial meeting one month later- solve problems, clarify misunderstandings and re-enforce knowledge.
	(2) Usual care
Outcomes	(1) Weight- no difference
	(2) Mean SBP/DBP- no difference
	(3) Withdrawals- 39% (E) vs 26% (C) significant difference
	(4) Knowledge questionnaire- improved knowledge in (E) group
	(5) Number of BP pills taken- no difference
	(6) Biochemical markers- no difference
	Duration of FU 6 months
Notes	(1) Knowledge improved, other outcomes no difference, withdrawal from the programme greater in the (E) 39% versus (C) 25%
	(2) Large proportion of (E) failed to attend an educational session, 83/138 (60%).
	(3) Sub-group analysis showed that 55/138 (40%) who attended one or more educational session did not have a different outcome in terms of all outcome measures at follow up, including SBP/DBP than those in intervention group who failed to attend sessions 83/138 (60%), except that those who attended had significantly higher probability of not withdrawing overall 3.6% vs 63%.
Allocation concealment	D

Study	**Rogers 2001**
Methods	Medical outpatients department, patients covered by insurance under care of 5 internists, New York state, US.
Participants	Previous diagnosis of hypertension but were being considered for change in BP medication because:
	(1) SBP 140 or DBP 90 despite current antihypertensive therapy
	(2) Side effects from drugs
	(3) SBP >180 or DBP >110 without current antihypertensive therapy
Interventions	(1) Telecommunication service with 3 components:
	"Automated BP at home with no self report

Interventions used to improve control of blood pressure in patients with hypertension (Review)

Copyright © 2006 The Cochrane Collaboration. Published by John Wiley & Sons, Ltd

39

Characteristics of included studies (*Continued*)

"Central processing of BP readings

"Weekly reports to both physician and patient. When physicians received report forms that indicated increased blood pressure they adjusted BP medication via telephone call, office visit or both. Readings minimum of 3 days each week for minimum 8 weeks

(2) Usual care

Outcomes	(1) Mean change in arterial blood pressure- improved -2.8mmHg (E) versus +1.3 (C) p=0.013
	(2) Mean change in systolic blood pressure- improved -4.9mmHg (E) versus -0.1 (C) p=0.047
	(3) Mean change in diastolic blood pressure- improved -2mmHg (E) versus +2.1 (C) p=0.012
	Median duration of FU 11 weeks
Notes	Change in mean arterial BP primary outcome via 24 hr ambulatory reading
	Change in BP medication related to change in mean arterial BP and was more common in intervention group, 33% (E) versus 7% (C) group.
	No change in median number of office visits
	Difference in median length of FU (longer in intervention group, 79 vs 72 days)
	Satisfaction with care same in both groups
Allocation concealment	A

Study	**Rudd 2004**
Methods	Parallel RCT, two medical clinics
Participants	Hypertension- SBP ?140 mmHg or DBP ?90mmHg in previous six months or history of drug treatment. Drug therapy for patients with 150 mmHg or DBP 95 mmHg.
Interventions	(1) Self measurement with nurse management based on algorithm. Twice daily measurement, after 14 measurements mailed to nurse care manager who used this BP data to give management. Additional interventions included tips on enhancing drug adherence and recognition of possible side effects; printed materials; follow up calls at 1 week, 1, 2 and 4 months. Nurse contacted physicians to initiate new drugs not did not contact physicians when changing medication dosage. Increase in drug dose occurred when <80% measurements met criterion of 130/85mmHg.
	(1)
Outcomes	Usual care
Notes	(1) Blood pressure- mean change DBP -6.5 mmHg (E) versus mean change DBP 3.4 mmHg (C)
	(2) Increase in taking and intensification of antihypertensive drugs-22% (E) and 30% (C) patients taking antihypertensive medication, changed to 96% (E) and 78% (C). Significant increase in number taking ?drugs 70% (E) and 46% (C).
	(3) Improved adherence to mediation-80.5% (E) versus 69.2% (C)
	Duration of FU 6 months
Allocation concealment	B

Study	**Sackett 1975**
Methods	Factorial RCT
	Steel mill employees in Canada
Participants	Hypertension 95mmHg on repeated measurement. Not currently treated. n=230.
Interventions	(1) Augmented convenience (AC)
	Saw on-site physicians during working hours and on full pay versus usual care of seeing their own GP
	(2) Mastery learning (ML)
	Educational programme designed to give them the facts about hypertension, including compliance advice and reminders about pill-taking. Information supplied in audio-casette and booklet. Mastery learning re-emphasised by a "patient educator"
	(3) Both intervention

Characteristics of included studies (*Continued*)

	(4) Usual care
Outcomes	(1) Number men placed on BP medication increased in both groups AC (87/114, 76% vs 57/116, 49%) ML (80/115, 70% vs 64/115, 56%) (2) Compliance- no difference AC (47/87, 54% vs 29/57, 51%) ML (40/80, 50% vs 36/64, 56%) (3) Compliance and at goal BP (<90mmHg)- no difference AC (20/87, 23% vs 11/57, 19%) ML (19/80, 24% vs 12/64, 19%) Duration of FU 6 months
Notes	Knowledge improved significantly in the Mastery learning group (85% vs 18%). Individual compliance rates bore no relationship to knowledge.
Allocation concealment	B

Study	**Sanders 2002**
Methods	Cluster RCT, two of three primary care group practices, Virginia, US. 22 primary care physicians
Participants	Hypertension and diabetes, 30 years of older, on medication for both conditions, blood pressure "greater than normal" on an index visit.
Interventions	(1) Chart reminder- consisted on a bright cardstock consisting of information on the following: description of the problem; recommended target blood pressures, algorithm for suggested care (modified from US JNC VI guidelines). Participating physicians not reminded in any other way. (2) Usual care
Outcomes	(1) Blood pressure- mean SBP 148mmHg (E) versus 150.87, p=0.14, mean DBP 75.14mmHg (E) versus 77.21mmHg (C), p=0.16 (2) Medication change- 31% (E) versus 36% (C), p=0.51 Duration of FU "as soon as feasible after the chart reminder was placed and the clinic visit conducted.
Notes	Cluster RCT analysed at individual level
Allocation concealment	B

Study	**Soghikian 1992**
Methods	Parallel, 430 individuals in four medical centres, California, USA referred by 67 physicians
Participants	Hypertension but no entry BP level required or defined. DBP <90mmHg in 60% (C) 59% (E), 90-104mmHg 33% (C) 37% (E), 105mmHg 7% (C) 4% (E) patients. 82% (C) 88% (E) patients taking BP lowering medication. 14% had end organ damage of cardiovascular event during the year of the trial
Interventions	(1) Home blood pressure measurement- patients asked to measure BP twice weekly, mail record of BP, medications and side effects to project office every 4 weeks. Data compiled and sent to each patient's physician. Non compliant patients were contacted and urged to submit readings. (2) Usual care
Outcomes	(1) Use of medical services- mean number hypertension related office visits 1.2 less in (E) group, telephone calls 0.8 more in (E) group, procedures per patient the same. (2) Cost of services- mean cost significantly lower $88.28 (E) vs $125.37 (C) (3) Blood pressure control lower in (E) group - mean SBP (E) 135.9mmHg versus (C) 142mmHg unadjusted difference-6.1mmHg NS; DBP (E) 86.2mmHg versus (C) 88mmHg, unadjusted difference -1.8mmHg. NS (4) Patient and physician satisfaction- high for (E) group

Characteristics of included studies (*Continued*)

	Duration of FU 1 year
Notes	Costs lower in (E) group (29%) with a non significant trend in reduction of SBP/DBP.
Allocation concealment	B

Study	**Solomon 2002**
Methods	Parallel, individuals from ten departments of Veterans Affairs medical centres and one academic medical centre, US
Participants	Treated hypertensive patients (dihydropyridine and/or diuretic therapy) (n=133), 64% caucasian, 28% black, 96% men, mean age 67 years,
Interventions	(1) Patient-centred pharmaceutical care model (employing standardised care) implemented by clinical pharmacy residents, scheduled visits at one-month intervals for a total of five visits (2) Usual care
Outcomes	(1) Blood pressure control- SBP improved (E) 138.5mmHg versus (C) 144.9mmHg (p<0.05), DBP (E) 80.2mmHg versus (C) 83.2mmHg NS (2) Compliance (pill count, self report)- better compliance scores (0.23 vs 0.61) in (E) group (p<0.05) (3) Mean number of hospitalisations/other health care provider visits- significantly higher in (C) group Duration of FU 6 months
Notes	Losses to follow up not reported
Allocation concealment	B

Study	**Takala 1979**
Methods	Hypertensive patients identified through systematic screening of 1245 individuals. To be included had to have two BP readings, six months apart with high blood pressure on not on BP treatment
Participants	Hypertensive patients in Finland, n=147, aged 40-49, SBP 160mmHg or DBP 95mmHg; aged 50-64, SBP 170mmHg or DBP 105mmHg. Drug treatment started in 78/93 (84%) in intervention group and 86/100 (86%) in control group
Interventions	(1) "Improved treatment system" included: Written treatment instructions. Card with details of BP readings, drugs prescribed, time of next appointment. Appointments at one monthly intervals. Invitation for outpatient review; appointment if defaulted on any appointment. (2) Usual care
Outcomes	(1) "Dropping out" of system- failing to keep outpatient follow up appointment. Improved in (E) 3/100 versus (C) 16/102 (2) Control of SBP/DBP reported separately in two age groups (aged 50) (3) % patients in each group who attained BP goal, 31% (E) vs 17% (C) Duration of FU 1 and 2 years.
Notes	
Allocation concealment	B

Study	**Takala 1983**
Methods	Hypertensive patients identified through systematic screening of 1245 individuals. To be included had to have two BP readings, six months apart with high blood pressure on not on BP treatment
Participants	Hypertensive patients in Finland, aged 40-49, SBP 160mmHg or DBP 95mmHg; aged 50-64, SBP 170mmHg or DBP 105mmHg. Drug treatment started in 78/93 (84%) in intervention group and 86/100 (86%) in control group
Interventions	(1) "Improved treatment system" included: Written treatment instructions. Card with details of BP readings, drugs prescribed, time of next appointment. Appointments at one monthly intervals. Invitation for outpatient review; appointment if defaulted on any appointment. (2) Usual care

Characteristics of included studies (*Continued*)

Outcomes	(1) "Dropping out" of system- failing to keep outpatient follow up appointment. Improved in (E) 3/100 versus (C) 16/102 (2) Control of SBP/DBP reported separately in two age groups (aged 50) (3) % patients in each group who attained BP goal, 31% (E) vs 17% (C) Duration of FU 1 and 2 years.
Notes	
Allocation concealment	B

Study	Tanner 1981
Methods	Hypertensive patients attending in a single urban family practice. Both groups visit family practice every 2 weeks for 4 months- total 8 appointments.
Participants	Diagnosis of hypertension from computer search with DBP 90mmHg, age 18-65. 50 identified, 30 agreed to participate, 11 males. 14 black
Interventions	(1) Intervention group given "Guide to essential hypertension" content included: hypertension; medication; diet; stress; exercise; smoking; lifestyle; bp monitoring techniques. Encouraged to ask questions and discuss problems when they at practice visits. (2) Usual care
Outcomes	(1) Knowledge- baseline and follow up-within group comparison knowledge E-13.53 to 14.40 increase C- 13.26 to 13.26 no change. Between group score significantly better in E versus C group. (2) Control of DBP- no difference Duration of FU 4 months
Notes	
Allocation concealment	B

Study	Vetter 2000
Methods	Parallel, individuals 244 practitioners in Switzerland, 4 patients per practitioner recruited
Participants	Hypertension, SBP 160-200mmHg or DBP 95-115mmHg in untreated patients or uncontrolled patients or who wished to change BP lowering drug because of low tolerance
Interventions	(1) Home measurement of blood pressure by patients (2) Usual care
Outcomes	(1) Blood pressure control- SBP improved (E) 145.1mmHg versus (C) 147.6mmHg(p=0.02), DBP improved (E) 88.7mmHg versus (C) 90.1mmHg (p=0.038). (2) % with controlled hypertension (DBP 90mmHg) 66.2% (E) vs 59.8mmHg (ns) Duration of FU 8 weeks
Notes	All patients treated with same BP lowering drug, Losartan 50mg once daily. No compliance data so not possible to say improved BP control due to improved compliance. Home BP measurement produced small BP change at 8 weeks
Allocation concealment	B

Study	Watkins 1987
Methods	6 General practices UK n=414, 41% male
Participants	Hypertension determined from medical records age range 35-64
Interventions	(1) Information booklet on hypertension sent out to patients (2) Usual care

Characteristics of included studies (*Continued*)

Outcomes	(1) (1) Systolic blood pressure- no difference 149.2mmHg (C) versus 149.8mmHg (E) (2) Diastolic blood pressure- no difference 94.9mmHg (C) versus 95.3mmHg (E) (2) Knowledge- slight increase in knowledge score in intervention group Duration of FU 1 year
Notes	Drop outs not reported in each arm
Allocation concealment	B

Study	**Webb 1980**
Methods	Parallel, individuals who were patients of 14 family practice residents US
Participants	Patients had to have at least: one year history of hypertension; uncontrolled DBP 90mmHg; taking BP lowering drugs
Interventions	(1) Education- three group education sessions by nurse-health educator (causes, nature, implications and treatment of hypertension) (2) Counselling- three "individualized" counselling sessions (3) Usual care- three appointments with family physician
Outcomes	(1) DBP- no difference between either group and usual care- education (E1) 88.9mmHg versus (C) 88.1mmHg, counselling (E2) 87.4mmHg versus 88.1mmHg (2) Compliance- no difference between either group and usual care (3) Return for follow up appointment- no difference education (E1)10.1 versus (C) 10.2, counselling (E2) 11.2 versus 10.2 Duration of FU 6 months
Notes	Negative RCT, data pooled from education arm of trial
Allocation concealment	B

Study	**Zarnke 1997**
Methods	Parallel individuals from eleven family physicians and one tertiary hypertension research unit, Canada
Participants	Age 52 (E) 56 (C), 13 (42%) male, average BP readings <160/95, taking BP lowering drugs or receiving non-pharmacological advice
Interventions	(1) Patient-directed group - instructed in home BP measurement, measured own BP twice daily and instructed by means of algorithm to change own BP medication, if still exceed goal to contact family doctor (2) Office-based group- adjustments to BP medication made by family doctor
Outcomes	(1) Change in daytime mean arterial BP adjusted for baseline measurement- decreased significantly in (E) group -0.95 versus +1.9 (C) (2) Compliance (doses missed per week- (E) 0.05 versus (C) 0.2 NS (3) Quality of life scores- no difference (4) Indices of health care resource use- total number of physician visits significantly greater in (E) group, no difference in total number of BP drugs used Duration of FU 8 weeks
Notes	Small RCT (n=31), short period of follow up
Allocation concealment	B

Study	**Zismer 1982**
Methods	Hypertensive patients in a single urban family practice. 176 eligible, 50 randomly selected, 39 agreed to take part. 3 groups- two separate intervention groups treated as the same in the analysis.

Characteristics of included studies (*Continued*)

Participants	Diagnosis of hypertension or receiving BP lowering drugs or elevated BP for 2 consecutive visits 140 or 90mmHg within previous 12 months 37 black, 21 male, average age 45 (E) 56 (C), age range 21 to 76.
Interventions	(1) Experimental group A- Educational "self-care" intervention: pill taking; appointment keeping; dietary sodium reduction (2) Experimental group B-received additional support from family member. (3) Usual care
Outcomes	(1) Systolic blood pressure- improved 150.9mmHg (C) versus 130.5mmHg (E), p<0.01. (2) Diastolic blood pressure- improved 92mmHg (C) versus 85mmHg (E), p<0.001. (3) Frequency of visits- no difference between groups in mean number of visits Duration of FU 6 months
Notes	BP readings at baseline and FU were mean of last 3 readings Control group was not similar to experimental group: 10 years older and diagnosed for longer
Allocation concealment	B

Characteristics of excluded studies

Andrejak 2000	Randomised trial of once daily versus twice daily ace inhibitor. Outcome compliance as judged by mem's monitored. Once daily medication better than twice daily dosage. Included in adherence systematic review. Excluded: adherence RCT
Bachman 2002	Accuracy and quality of self-reported home blood pressure values assessed. 48 patients randomised to receive information about storage capabilities of a home measuring device or not. Accuracy and interpretation of home blood measurement increased in the informed group. Reason for exclusion: intervention not aimed directly at improving blood pressure control; no blood pressure data reported.
Barron-Rivera 1998	Randomised trial of education programmed to patients. Outcome was well-being and quality of life. Excluded: no report on blood pressure control in the process of care.
Ben Said	Randomised trial of assessment education interventions - same trial as reported by Consoli. Excluded: no outcome on blood pressure or process of care reported.
Binstock 1988	Excluded because no "usual care" group.
Birtwhistle 2004	Equivalence RCT of three month versus six month follow up. Reason for exclusion: (1) Neither intervention met inclusion criteria of the review. No additional intervention directed at either patient, health professional or organisation of care. Finding that BP control was equivalent between three and six month follow up arms of the study. Both groups saw health professional much more often than planned over the three years- mean (sd) visits per patient in three month group 18.8 (8.06) versus 16.2 (8.45) in six month group.
Blenkinsopp 2000	Parallel, cluster randomised, 20 community pharmacy sites, UK. 180 treated hypertensives, 62% age 60 or over. (1) Pharmacist delivered, Structured, brief questioning protocol on medication problems; including advice, information and referral to general practitioner versus usual care, delivered three times at two-month intervals (2) Usual care. (1) % with controlled hypertension- of those patients with initially uncontrolled hypertension (160/90mmHg) (E) 35.7% versus (C) 17.1% were controlled at follow up (p<0.05), no difference in BP control in those who were controlled at start of study (2) Compliance (self report)- 62% (E) versus 50% (C) (p<0.05) (3) Patient satisfaction- high level with service and no significant differences between groups. Duration of FU 6 months. Substantial losses to follow up. Subgroup analysis of % controlled blood pressure, therefore not included in analysis. Reason for exclusion: no blood pressure data.

Characteristics of excluded studies (*Continued*)

Bond 1984	Non-randomised trial of clinical pharmacologist nurse clinician improving drug documentation, for blood pressure control and rheumatology/renal screening. Excluded: no BP outcome data
Broege 2001	40 hypertensive men and women randomly assigned to "home" self measurement with subsequent management and medication change compared to "clinic" group where medication adjusted based upon readings taken by project nurse. Reasons for exclusion: 1. Includes treated and untreated hypertensive patients. Drug treatments adjusted downward or treatment initiated depending on BP reading and drug treatment status. Not possible to detect effect of self monitoring on treated blood pressure alone. 2. No usual care- both groups experienced monitoring- self monitoring at home or nurse monitoring in clinic.
Cappuccio 2004	Systematic review of home monitoring. 18 RCTs included- several RCTs excluded from this review that Cappucion included. These are (with reasons why excluded from this review in brackets): Binstock- no usual care group included. Stahl- non randomised trial, patients allocated "sequentially". Midanik-
Caro 1998	Non-randomised trial. Observational study of compliance and persistance with therapy, excluded for these reasons.
Celis 1998	A randomised controlled trial protocol comparing self measurement of blood pressure against conventional blood pressure measurement. Protocol of trial. Excluded: no results reported.
Charlesworth 1984	Quasi randomised trial. Patients assigned random numbers and then rank ordered. The first 32 were given intervention, the next 22 were in the control group. Intervention was of stress management outcome SBP and DBP was significantly reduced in the stress management group. Excluded: intervention and wasn't properly randomised.
Consoli	Randomised trial of computer assisted programme intervention was educational. Outcome knowledge increased at two months in intervention group compared to control. Excluded as no outcome on blood pressure or process of care reported.
Consoli SM, Ben2	Randomised trial of computer assisted programme intervention was educational. Outcome knowledge increased at two months in intervention group compared to control. Excluded as no outcome on blood pressure or process of care reported
Consoli SM, Ben3	Randomised trial of computer assisted programme intervention was educational. Outcome knowledge increased at two months in intervention group compared to control. Excluded as no outcome on blood pressure or process of care reported
Cranney 1999	Non-randomised trial 9 pairs of practices matched by means of overall blood pressure control and then randomised to eductional intervention directed to health professionals in the practice. The outcome was a stated threshold for blood pressure control. Excluded because of non-randomised trial design.
Denver 2003	120 Type 2 diabetic patients with uncontrolled hypertension (BP >140/90) randomised to usual GP care or nurse-led outpatient care. Nurse led care associated with improved systolic blood pressure. Reasons for exclusion: (1) patients allocated by means of alternation rather than randomisation (2) setting.
Djerassi 1990	Non-randomised trial, before/after design. Intervention was based in factories program of follow-up treatment by planned doctor and nurse versus usual care by family doctor in other factories. Outcomes number of percentage of people treated with an intervention group was greater.
Dusing 1998	Observational study of 1603 patients in 320 private practices in Germany. Investigated change in antihypersensive theapy within six months of start of study. Inadequate BP control most important reason for change in 48.4% of patients in the cohort, others include: adverse effects 30.1%, patient dissatisfaction 20%, non-compliance 16.8%, cost 4.9%.
Erickson 1997	A non-randomised trial of pharmacist care which involved reviewing medical records, taking drug history, assessing patients specific drug issues, concerns about taking drugs, lifestyle, compliance and knowledge all direct to the patient. Outcomes SBP and DBP were reduced in the group who received a pharmacist's care at 5 months. Quality of life measures were the same. Trial excluded because it was not randomised.

Characteristics of excluded studies (*Continued*)

Flack 1995	Observational study reporting adherence rates with different classes of anti-hypertensive agents.
Flack 2000	Randomised trial of slow versus fast titration of blood pressure lowering drugs.
Foote 1983	Quasi randomised controlled trial. Four interventions, screening and referral to physician, referral to physician and semi-annual follow-up, referral to physician and more frequent follow-up, and on-site treatment. Outcome was the number of people under treatment, control and proved in the last three groups.
Girvin 1999	A randomised trial cross-over design of single versus twice a day Enalapril. The outcomes were of compliance which increased with the single dose medication and blood pressure control which is better in the twice a day medication group. Reason for exclusion, adherence randomised trial, included in the adherence systematic review.
Godley 2003	Evaluation of a quality improvement programmefor hypertension management. Intervention consisted of educating healthcare providers and recommending appropriate pharmacotherapy for compelling indications. 30,721 hypertensive patients identified from pharmacy claims, 417 patients randomly selected for note review. Overall level of blood pressure control stated to have improved from 37.2% to 49.2% at follow up. Reason for exclusion: not a randomised study; no comparison group.
Gonzalez-Fernandez	Parallel, individuals, hospitalised for "non-hypertensive related diseases) in a single hospital, Puerto Rico. 60 treated hypertensives, 55% women, mean age 59 years. (1) In-hospital education- 4 educational interventions: "knowing high BP" by a physician; "diet and high BP" by a dietician; "exercise and high BP" by a health educator; "medications and compliance in high BP" by physician and pharmacy student. (2) Usual care. (1) Blood pressure control- SBP and DBP improved in (E) 137mmHg versus (C) 154mmHg (p=0.005), diastolic (E) 89mmHg versus 98mmHg (p=0.006) (2) Compliance (direct questioning and pill count)- adherence improved by 66% in the intervention group compared to 16% in usual care group (p=0.04). Reason for exclusion: hospital-based RCT. Duration of FU 8 weeks
Grimm	A randomised trial of four different class of anti-hypertensive agents and quality of life. Excluded: no data on BP control, no interventions other than different classes of anti-hypertensive drugs.
Hatcher 1986	Factorial randomised trial of health education intervention. Three levels of intervention medication schedules, diet, appointment keeping, family member, reinforcements and small group meeting. Excluded as intervention was based on ? ? education and no outcomes on blood pressure control in the process of care.
Herbert 2004	2x2 factorial RCT of 28 peer learning groups involving 200 family physicians in British Columbia, Canada. Interventions: personalised prescribing feedback relating to hypertension; case-based educational module. Evidence-based prescribing improved in both groups (increase in thiazide prescribing as first line agents). Reason for exclusion: no blood pressure outcomes reported.
Hyman	Questionnaire study self reported physician practice excluded for that reason.
Inui 1976	Before/after study intervention with tutor physician educating patients regarding their hypertension. Excluded: not a randomised trial.
Iso 1996	Randomised trial of health education advice (non-pharmacological) follow-up was at 6 months and one and half years. Excluded: intervention was based around health education/counselling advice.
Iso H,	Randomised trial of health education classes to patients. Excluded as intervention was non-pharmacological advice.
Kawachi 1991	Non-randomised trial. Cost effectiveness analysis.
Krishan 1979	Non-randomised trial of nurse practitioner and integrated physician supervised management in community hypertension clinics versus usual care. No difference in outcome of blood pressure control.
Lewis 1967	Randomised trial of nurse clinics versus usual care in outpatient clinic. The population included patients with Hypertension and Atherosclerotic Disease, Obesity, Arthritis and Psychophysiological Disorders. The outcomes are preferences for care, costs and process of care in terms of examinations and investigations. Excluded: no data on process or outcome of blood pressure care.
Linjer 1997	Non-randomised trial. Discussion paper regarding percentage of patients eligible in randomised trials generally at low risk in trial participants.

Characteristics of excluded studies (*Continued*)

Littenberg 1990	Non-randomised trial. Cost effectiveness study of increased blood pressure.
Marquez 2000	Randomised trial intervention being health education through group sessions with postal back-up. Outcomes were compliance with blood pressure medication. Excluded as no outcome in terms of blood pressure control reported
Mashru 1997	Before after study of interpractice audit following educational programme concerning diagnosis and managment of hypertension. Six general practices in NW London, UK, 750 hypertensive patients. At two years follow up, two thirds of patients remained "uncontrolled" (BP<160/90).
McDowell 1989	Non hypertensive patients registered with a large family practice (Canada). Interventions: computer reminder to GP, letter to patient, nurse telephone call to patient. Outcome was whether blood pressure was checked or not. Effect of reminders was "modest"
McInnes 1995	Non-randomised trial two patients were matched and then randomised to it. Shared care or clinical care. The intervention was computerised shared care versus hospital clinical care in outpatients departments. The outcome showed there were less drop-outs for shared care and they were better adequately used in terms of patient management in shared care compared to usual care. Shared care was more cost effective. Blood pressure control was similar in both groups.
McKenney 1973	A pharmacist intervention directly at patients improved knowledge compliance with medication and blood pressure control, however not randomised properly. Patients assigned consecutive numbers then randomised according whether they had odd or even numbers
Murray 1988	Not hypertensive patients. Population: persons "at risk" of developing hypertension. Intervention: direct mail to prompt attendance at clinic, either single, multiple or no mail. Outcome: number of patients who had a blood pressure checked or discussed with their physician
New 2003	Specialist nurse-led clinic in a single outpatient clinic in Salford, UK. Population: diabetic patients receiving hospital-based care. Comparison group: usual hospital care. Outcome: improvement in blood pressure and hyperlipidemia targets acheived with intervention. Reason for exclusion: hosptial-based, (2) diabetic patients.
Pheley 1995	Observational study of nurse based hypertension clinic with no comparison group.
Putnam 1989	40 family physicians from the Dalhousie University Division of Continuing Medical Education separated into 3 groups according to extent of involvement in establishing essential criteria for hypertension managment. No difference in control of blood pressure in these family physician's patients at 18 months follow up. Reason for exclusion: non randomised trial
Ramsay 1996	Non-randomised trial. Discussion paper.
Staessen 2004	Randomised trial of treatment based on (1) BP measured at home (3 consecutive measurements twice daily) versus (2) BP measured at physician's office (average of 3 consecutive readings taken by physician during practice hours). Reason for exclusion: (1) Assessed self monitoring in the context "as guides to initiate and titrate antihypertensive drug treatment". (2) Treated and untreated patients included. At follow-up (median 350 days), more home BP than office BP patients had stopped antihypertensive drugs with no difference between groups of patients who had progressed to multiple drug treatment. Final office, home and 24-hour ambulatory BP measurements were higher in the home BP group than in the office BP group.
Stahl 1984	Non-randomised trial. Self and family read blood pressure monitoring groups plus nurse education. Excluded because of non-randomised study.
Statson 1977	Non-randomised trial. Examining the cost effectiveness of treatment of hypertension
Stephenson 1999	Non-randomised trial.
Trocha 1999	91 hypertensive type 1 diabetic patients with overt diabetic nephropathy followed for 10 years. Intensfied versus routine antihypertensive treatment. Blood pressure control and survival improved in the intensified group. Reason for exclusion: non randomised study

Characteristics of excluded studies (*Continued*)

Tu 1999	Parallel, individuals 222 attending a "health unit clinic", carried out in a veteran home in Taiwan, China. Hypertension, SBP 140 or DBP 90 in untreated patients or treated hypertension patients BP level not stated. Average age 74.6 years. (1) Medical education group (MEG)- monthly meeting concerning cognition, attitude self-care behaviours for hypertension (2) Health education- same content but delivered every other month group (EOMG). Differences between groups not clearly reported. Stated that no difference in attitudes and behaviour between groups. Blood pressure no difference in SBP but higher DBP in EOMG. Between group differences not clearly stated. Table 3, within group differences all improved for "cognition, behaviours and attitudes" scores and "blood pressure marking" changes. Duration of FU 6 months. Reason for exclusion: no BP data for both arms of study reported.
UK PDS 1998	Randomised trial of tight less tight blood pressure control. Excluded because its not reporting on process and organisational issues in hypertension care.
Waeber 1999	Randomised trial of compliance in terms of aspirin versus placebo from the HOT randomised controlled trial
Weiner 1980	Cluster- six "industrial settings" randomised. Ohio county clinics US, SBP>140 or DBP >90 age 19-39, SBP >150 or DBP >90 age 40-64. (1) Nurse management. Involved reinforcement to take medication, information about side effects of medications, diet instruction, BP checks, weight checks, education and counselling regarding "an understanding and acceptance of hypertension", (2) Usual care. Positive RCT reported. Experimental patients had better: (1) Decreases in maximum SBP (p=0.02) (2) Average SBP (p=0.02) (3) % overweight (p=0.01) (4) Improved knowledge (p=0.002). Duration FU 3 months. No difference found for maximum and average DBP between (E) and (C). Only very brief account of RCT with no details of baseline or follow up blood pressure. Reason for exclusion: no blood pressure data.
Weir 2002	Questionnaire survey a combination of lifestyle medication taking in half outcomes
Wollard 1995	Randomised trial at two levels of intensity, lifestyle advice/counselling from practice nurses. Outcome was lifestyle and non-pharmacological change in patients. Excluded because intervention was based on non-pharmacological advice and outcomes included lifestyle changes. Of note intervention was more effective than usual care.
Wyka-Fitzgerald 1984	Randomised trial of nurse education programme directed at patients intervention was non-pharmacological advice so excluded for this reason.
Zernike 1998	Randomised trial of structured patient-centred education programme versus normal information. Outcome patient knowledge which was increased and structured intervention. Excluded as no outcomes reported on blood pressure control or process of care.
van den Hoogen 1990	Non randomised study. "Experimental" study but no mention of randomisation. 15 general practices in the Netherlands, newly detected patients with hypertension two years prior to start of study aged 36-55 years. Intervention: computer-assisted monitoring system, provides monthly feedback on treatment results, regular meetings at practices where surveys discussed. Outome: improved surveillance and control of blood pressure in computer group

Characteristics of ongoing studies

Study	Coppola
Trial name or title	Improving the primary prevention of stroke in older patients in general practice: a randomized controlled trial
Participants	Elderly patients (aged between 60 to 75 years) registered in 20 general practices in London UK
Interventions	Intervention directed at health professionals in general practices. One hour seminar
Outcomes	Blood pressure control

Characteristics of ongoing studies (*Continued*)

Starting date	Not known
Contact information	pwhincup@sghms.ac.uk
Notes	

Study	Krieger
Trial name or title	SHIP Clinic-Based Program
Participants	1. Patients currently at a participating clinic with a diagnosis of hypertension. 2. Low income. 3. Caucasian or African American. 4. Aged 18 or older
Interventions	1. Patient care co-ordinator at each clinic. 2. Computerised tracking system. 3. Linkage with outreach workers. 4. Linkage with community-based resources
Outcomes	1. Mean systolic and diastolic blood pressure. 2. Non-pharmacological behaviour change 3. Control of blood pressure
Starting date	Not known
Contact information	James Krieger James.krieger@METROC.GOV
Notes	RCT complete, anticipated publication in 2003

Study	McManus
Trial name or title	A randomised controlled trial of patient held targets and self monitoring in the control of hypertension: Targets And Self Monitoring IN Hypertension (TASMINH)
Participants	441 patients aged 35-75 with known hypertension (coded by own general practitioner), on antihypertensive drug treatment with a blood pressure greater than 140/85 at randomisation drawn from eight practices in Birmingham UK, two practices each drawn from a quartile of Townsend (deprivation) score
Interventions	All patients receive information on non pharmacological methods (British Hypertension Society self help leaflet). Intervenion group taught to check their own blood pressure using OMRON blood pressure monitor at their own surgery/practice. Patients asked to check monthly. Patients given British Hypertension Society targets (140/85 or 148/80 for diabetic patients). Patients requested to attend their family doctor (general practitioner) to discuss treatment with antihypertensive drugs if their blood pressure reading exceeds target reading two months continuously. Control group receive usual care from their family doctors (general practitioners)
Outcomes	1. Blood pressure reading at 12 months follow up
Starting date	September 2001, last patient randomised March 2002, final follow up March 2003
Contact information	Dr Richard McManus r.j.mcmanus@bham.ac.uk 0121 414 2658
Notes	RCT nearly complete, anticipate publication late 2003/early 2004

Study	Sullivan
Trial name or title	HYPER Trial
Participants	Elderly (aged 65-79) hypertensive patients majority of patients were taking antihypertensive medication at baseline
Interventions	Aim to evaluate the provision of diferent levels of feedback developed from computerised GP data. 52 Scottish general practices randomised to three groups:

Characteristics of ongoing studies (*Continued*)

	1. Usual care. 2. Feedback of audit data (information about patients who need either screening, assessment or treatment). 3. Strategic feedback prioritising patients by absolute risk of death from stroke
Outcomes	1. Blood pressure measurement 2. Mean systolic and diastolic blood pressure 3. Blood pressure control
Starting date	August 1999
Contact information	Liz Mitchell e.d.mitchell@dundee.ac.uk
Notes	RCT complete, data being analysed and report should be in the public domain in 2003

Study	Zarnke
Trial name or title	Not known
Participants	Patients with uncontrolled hypertension
Interventions	Patient-directed self measurement
Outcomes	1. Blood pressure measurement 2. Mean systolic and diastolic blood pressure 3. Blood pressure control
Starting date	Not known
Contact information	kelly.zarnke@lhsc.on.ca
Notes	RCT complete, data being analysed

ADDITIONAL TABLES

Table 01. Quality of included randomized trials

Study ID	Randomization	Allocation concealed	Blinding	Losses to follow up
Carnahan	Method not stated	Not stated	No	1/50 (E- 2%) 2/50 (C- 4%) 1/50 (E- 2%) 2/50 (C- 4%) 1/50 (E- 2%) 2/50 (C- 4%)
Hawkins	Method not stated	Not stated	No	225/574 (E- 39.2%) 294/574 (C-51.2%)
Evans	Method not stated	Not stated	Yes- BP check Staff "blind" to allocation group	5/107 (E- 5%) 10/91 (C- 11%)
Hypertension Detection and Follow up (HDFP)	Randomisation done centrally, stratified by centre (n=14) and entry DBP strata (n=3)	Yes, coordinating centre prepared sealed opaque envelopes. An envelope was drawn sequentially and attached to participant's data form at the time of DBP screening. Envelope opened after baseline	No- neither participant or clinic blind to randomisation. BP outcome not blinded	967/5485 (E- 17.6%) 938/5422 (C-17.2%) status of antihypertensive drug treatment not known at 1 year (includes lost to FU/dead/missing data)

Table 01. Quality of included randomized trials (*Continued*)

Study ID	Randomization	Allocation concealed	Blinding	Losses to follow up
Jewell	Method not stated	Not stated	No	15/17 (E- 12 19/19 (C- 0%)
Cummings	”Randomisation list“	Not stated	Yes	446\486 (E- 8%) 420\487 (C- 14%)
Tanner	”Randomly assigned through a table of random numbers“	Not stated	No	15/15 (E- 0%) 15/15 (C- 0%)
Zismer	Not stated	Not stated	No	26/26 (E- 0%) 13/13 (C- 0%)
Watkins	Not stated but stratified by age, sex, practice and last recorded BP	Not stated	Yes	414/565 (Overall- 27%)
Rogers	Randomisation stratified by # prescription medications	Yes- to physicians and clinical research staff but once completed ”open“	No	56/60 (E-7%) 55/61 (C- 10%)
Muhlhauser	Randomisation process for 10 participating practices. 20 patients per practice selected by means of random number chart	Not stated	No	86/100 (E- 14%) 74/100 (C- 26%)
Montgomery	Randomisation by means of random number table by a researcher not involved in study. Practices stratified by computer system used (2 alternative computer systems)	Yes	No	202/229 (E 1 12%) 199/228 (E 2- 13%) 130/157 (C- 17%)
Takala	Method not stated	Not stated	No	25/100 (E- 25%) 32/102 (C- 31%)
Sackett	Method not stated	Not stated	Yes	Factorial RCT (1) Convenience Augmented 6/114 (E-5%) Normal 4/116 (C- 3%) (2) Mastery learning Yes 8/115 (E-7) No 2/115 (C- 2%)
Haynes	Minimisation, method not stated, patients stratified according to important prognostic factors in previous RCT	Not stated	Yes	0/20 (E- 0%) 1/19 (C- 5%)

Table 01. Quality of included randomized trials (*Continued*)

Study ID	Randomization by Sackett20	Allocation concealed	Blinding	Losses to follow up
Logan	Method not stated	Not stated	Yes	26/232 (E- 11%) 21/204 (C- 9%)
Johnson	Method not stated	Not stated	Yes	Factorial RCT (1) Self recording of blood pressure (E- 34/36- 6%) (2) Home visits (C-34/36- 6%)
Brook	By means of "random sampling techniques that made the distribution of family characteristics in each as similar as possible"	Not stated	No	Free care versus 3 forms of cost-sharing plans. Blood pressure outcome: Free care (E- 134/294, 46%) Cost share (C-
Earp	Method not stated	Not stated	No	3 arm RCT Follow up at year 1 and 2 Group 1- 1 year- 74/99, 25% 2 year- 55/99, 44% Group 2- 1 year- 41/56, 27% 2 year- 39% Group 3(control)- 1 year- 47/63, 25% 2 year- 38/63, 40%
Martinez-Amenos	Method not stated	Not stated	No	No details on losses to FU provided
McAllister	Practice cluster stratified by: 1) partners 2) Ethnicity randomisation by "shuffled deck of cards"	Not stated	No	5/30 (E- 17%) 5/30 (C- 17%)
Bogden	Randomisation by last digit of social security number: Odd # (E) Even # (C)	Not stated	Yes	1/50 (E- 2%) 4/50 (C- 8%)
Fielding	Randomisation by means of random numbers table	Not stated	No	6/80 (E- 7%) 8/79 (C- 10%)
Morisky and Levine	Randomisation through "simple random	Not stated	No	Overall 64/400 (16%) Control of BP

Table 01. Quality of included randomized trials (*Continued*)

Study ID	Randomization	Allocation concealed	Blinding	Losses to follow up
	sampling procedures"			(C) 40/50 (20%) 2 yrs 30/50 (40%) 5 yrs (E) all 3 intervention 44/50 (12%) 2 yrs 42/50 (16%) 5 yrs
Zarnke	Randomisation by means of computer generated list in blocks of six. Asymmetric allocation scheme (2:1 E:C)	Not stated	No	0/20 (E- 0%) 1/11 (C- 9%)
Roca-Cusachs	Research nurse "allocated every patient to one of the two groups using a random scale balanced for age and BP"	No	Yes	54/138 (E- 39%) 38/149 (C- 26%)
Soghikian	Method not stated	Not stated	No	15/215 (E- 7%) 25/215 (C- 12%)
Billault	Method not stated	Not stated	No	82/101 (E- 19%) 85/99 (C- 14%)
Gullion	Method not stated, physicians stratified according to four criteria: (1) % patients whose DBP controlled. (2) % patients responding to the survery (3) Physician's ethnic group (4) Specialty	Not stated	Yes	(1) Medical- 27 (2) Behavioural- 28 (3) Both- 30 (4) Neither- 27
Friedman	Randomized "using a paired randomisation protocol"	Not stated	Yes	23/133 (E- 17%) 11/134 (C- 8%)
Hetlevik	Method not stated	Not stated	No	816/984 (E- 17.1%) /1255 (C- 18.5%)
Krieger	Randomisation based on computer-generated random number table	Sealed opaque envelopes, sequentially numbered. Not clear who allocated individuals to groups	No	146/209 (E- 30.1%) 165/212 (C- 22.2%)
Dickinson	Method not stated	Not stated	No	51/51(E feedback- 0%)

Table 01. Quality of included randomized trials   (*Continued*)

Study ID	Randomization	Allocation concealed	Blinding	Losses to follow up
				78/78 (E education- 0%) 88/88 (E both- 0%) 33/33 (C neither- 0%)
Barnett	Method not stated but stratified by age and intial DBP (100mmHg or <100mmHg)	Not stated	No	44/63 (E- 30%) 27/52 (C- 48%)
Bulpitt	Method not stated	Not stated	No	25/136 (E- 18%) 36/142 (C- 25%)
Coe	Method not stated	Not stated	Yes	56/56 (E- 0%) 60/60 (C- 0%)
Robson	Random number tables	Not stated	No	?/1620 (E- ?%) ?/1586 (C- ?%)
Bloom	Method not stated	Not stated	Yes	12/27 (E- 44%) 19/27 (C- 74%)
Fletcher	Patients were "divided by meams of a table of random numbers"	Not stated	Uncertain	144/155 (93%) followed up at five months. Group losses to FU not reported
Bailey	Method not stated	Not stated	Yes	29/30 (E- 3%) 31/32 (C- 3%)
Webb	Method not stated	Not stated	Yes	37/37 (E1-0%) 31/31 (E2-0%) 55/55 (C-0%)
Hamilton	Method not stated	Not stated	No	0/17 (E- 0%) 4/17 (C- 24%)
Park	Method not stated	Not stated	No	5/32 (E- 16%) 6/32 (C- 19%)
Mehos	Yes "randomized using a deck of cards"	Not stated	No	2/20 (E- 10%) 3/21 (C- 14%)
Pierce	Yes "minimisation"	Not stated	Yes	59/59 (E health education)-0%) 54/57 (E monitor-8.5%)
Solomon	Yes, random number tables	Not stated	No	63/63 (E- 0%) 70/70 (C- 0%) 63/63 (E- 0%) 70/70 (C- 0%)
Burelle	Not stated	Not stated	No	8/8 (E- 0%) 8/8 (C- 0%)
Ahluwalia	Yes, computer generated random number table	Not stated	No	8/8 (E- 0%) 8/8 (C- 0%)

Table 01. Quality of included randomized trials (*Continued*)

Study ID	Randomization	Allocation concealed	Blinding	Losses to follow up
Vetter	Not stated	Not stated	No	296/296 (E- 0%) 326/326 (C- 0%)
Garcia-Pena	Randomisation by computer	Yes	Yes	345/345 (E- 0%) 338/338 (C- 0%)
Artinian	Method not stated	Not stated	No	6/6 (E), 9/9 (C)
Midanik	Method not stated	Not stated	No	74/102 (E- 28%) 72/102 (C- 30%)
New	Method not stated	Not stated	No	99/506 (19.6%) in intervention group compared to 132/508 (26.0%) in control group
Rudd	Computer-generated assignment	Not stated	Blind outcome assessment	74/74 (E-0%) 74/74 (0%)
Ornstein	"Balanced adaptive randomisation scheme", 3 practice characteristics were: practice specialty, practice size and geographical location	Not stated	No- open RCT	4446/4446 (E- 0%) 3326/3326 (C- 0%)

A N A L Y S E S

Comparison 01. Active intervention versus control

Outcome title	No. of studies	No. of participants	Statistical method	Effect size
01 Self monitoring (systolic blood pressure)	10	1860	Weighted Mean Difference (Fixed) 95% CI	-2.50 [-3.87, -1.13]
02 Self monitoring (diastolic blood pressure)	12	1966	Weighted Mean Difference (Fixed) 95% CI	-2.03 [-2.69, -1.38]
03 Self monitoring (BP control)	4	948	Odds Ratio (Fixed) 95% CI	0.88 [0.67, 1.15]
11 Patient education (systolic blood pressure)	7	1136	Weighted Mean Difference (Fixed) 95% CI	-2.54 [-4.55, -0.53]
12 Patient education (diastolic blood pressure)	9	1258	Weighted Mean Difference (Fixed) 95% CI	-0.81 [-1.83, 0.21]
13 Patient education (BP control)	5	530	Odds Ratio (Fixed) 95% CI	0.66 [0.44, 1.01]
21 Physician education (systolic blood pressure)	6	2839	Weighted Mean Difference (Fixed) 95% CI	-2.03 [-3.45, -0.62]
22 Physician education (diastolic blood pressure)	6	2839	Weighted Mean Difference (Fixed) 95% CI	-0.43 [-1.12, 0.27]
23 Physician education (BP control)	6	13985	Odds Ratio (Fixed) 95% CI	0.85 [0.80, 0.91]
31 Health professional led care (systolic blood pressure)	5	1590	Weighted Mean Difference (Fixed) 95% CI	-2.14 [-3.59, -0.68]
32 Health professional led care (diastolic blood pressure)	6	2000	Weighted Mean Difference (Fixed) 95% CI	-1.55 [-2.11, -0.98]

33 Health professional led care (BP control)	5	1271	Odds Ratio (Fixed) 95% CI	0.24 [0.18, 0.32]
41 Organisation/protocol driven care (systolic blood pressure)	7	7072	Weighted Mean Difference (Fixed) 95% CI	-8.55 [-9.40, -7.70]
42 Organisation/protocol driven care (diastolic blood pressure)	7	7072	Weighted Mean Difference (Fixed) 95% CI	-4.58 [-4.98, -4.19]
43 Organisation/protocol driven care	5	11406	Odds Ratio (Fixed) 95% CI	0.43 [0.40, 0.46]
51 Appointment reminder (appointment interventions) (outcome: lost to follow up at clinic)	6	1704	Odds Ratio (Fixed) 95% CI	0.41 [0.32, 0.51]

INDEX TERMS

Medical Subject Headings (MeSH)

Antihypertensive Agents [*therapeutic use]; *Blood Pressure [drug effects]; Education, Medical, Continuing; Hypertension [drug therapy; *therapy]; Patient Education; Randomized Controlled Trials

MeSH check words

Humans

COVER SHEET

Title	Interventions used to improve control of blood pressure in patients with hypertension
Authors	Fahey T, Schroeder K, Ebrahim S
Contribution of author(s)	All authors contributed to the design, data extraction, analysis and write up of the review
Issue protocol first published	2002/2
Review first published	2005/1
Date of most recent amendment	22 November 2004
Date of most recent SUBSTANTIVE amendment	07 October 2002
What's New	Information not supplied by author
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	Information not supplied by author
Date authors' conclusions section amended	Information not supplied by author
Contact address	Prof Tom Fahey Professor of Primary Care Medicine Division of Community Health Sciences University of Dundee

MacKenzie Building
Kirsty Semple Way
Dundee
DD2 4AD
UK
E-mail: t.p.fahey@chs.dundee.ac.uk
Tel: +44 1382 420018
Fax: +44 1382 420010

GRAPHS AND OTHER TABLES

Analysis 01.01.   Comparison 01 Active intervention versus control, Outcome 01 Self monitoring (systolic blood pressure)

Review: Interventions used to improve control of blood pressure in patients with hypertension

Comparison: 01 Active intervention versus control

Outcome: 01 Self monitoring (systolic blood pressure)

Study	Treatment		Control		Weighted Mean Difference (Fixed) 95% CI	Weight (%)	Weighted Mean Difference (Fixed) 95% CI
	N	Mean(SD)	N	Mean(SD)			
Artinian 2001	6	-25.00 (13.80)	9	1.00 (14.10)		0.9	-26.00 [-40.38, -11.62]
Bailey 1998	31	-8.00 (19.40)	29	-13.00 (19.00)		2.0	5.00 [-4.72, 14.72]
Carnahan 1975	49	-18.00 (18.50)	48	-10.50 (14.90)		4.2	-7.50 [-14.18, -0.82]
Friedman 1996	110	-11.00 (13.40)	123	-10.60 (13.70)		15.4	-0.40 [-3.88, 3.08]
Mehos 2000	18	-17.10 (15.80)	18	-7.00 (13.90)		2.0	-10.10 [-19.82, -0.38]
Midanik 1991	74	-1.00 (15.80)	72	1.00 (17.30)		6.5	-2.00 [-7.38, 3.38]
Rogers 2001	56	-4.90 (13.50)	55	-0.10 (13.40)		7.5	-4.80 [-9.80, 0.20]
Rudd 2004	74	-14.20 (17.80)	76	-5.70 (18.40)		5.6	-8.50 [-14.29, -2.71]
Soghikian 1992	200	-1.50 (13.90)	190	1.80 (17.00)		19.6	-3.30 [-6.39, -0.21]
Vetter 2000	296	-21.00 (14.50)	326	-20.50 (14.30)		36.4	-0.50 [-2.77, 1.77]
Total (95% CI)	914		946			100.0	-2.50 [-3.87, -1.13]

Test for heterogeneity chi-square=26.66 df=9 p=0.002 I?? =66.2%

Test for overall effect z=3.59   p=0.0003

```
        -10.0   -5.0    0    5.0   10.0
        Favours treatment    Favours control
```

Analysis 01.02.   Comparison 01 Active intervention versus control, Outcome 02 Self monitoring (diastolic blood pressure)

Review: Interventions used to improve control of blood pressure in patients with hypertension

Comparison: 01 Active intervention versus control

Outcome: 02 Self monitoring (diastolic blood pressure)

Study	Treatment		Control		Weighted Mean Difference (Fixed)	Weight	Weighted Mean Difference (Fixed)
	N	Mean(SD)	N	Mean(SD)	95% CI	(%)	95% CI
Artinian 2001	6	-14.00 (8.70)	9	-2.00 (9.90)		0.5	-12.00 [-21.50, -2.50]
Bailey 1998	31	-6.00 (2.80)	29	-4.00 (2.80)		21.2	-2.00 [-3.42, -0.58]
Carnahan 1975	49	-10.40 (9.80)	48	-10.40 (9.80)		2.8	0.00 [-3.90, 3.90]
Friedman 1996	110	-5.20 (8.30)	123	-0.80 (8.00)		9.7	-4.40 [-6.50, -2.30]
Haynes 1976	20	-5.40 (5.70)	18	-1.90 (5.40)		3.4	-3.50 [-7.03, 0.03]
Johnson 1978	34	-8.50 (8.10)	34	-7.50 (11.30)		2.0	-1.00 [-5.67, 3.67]
Mehos 2000	18	-10.50 (10.40)	18	-3.80 (9.30)		1.0	-6.70 [-13.15, -0.25]
Midanik 1991	74	1.00 (9.40)	72	1.00 (8.40)		5.1	0.00 [-2.89, 2.89]
Rogers 2001	56	-1.90 (10.00)	55	2.10 (10.00)		3.1	-4.00 [-7.72, -0.28]
Rudd 2004	74	-6.50 (9.90)	76	-3.40 (7.80)		5.2	-3.10 [-5.96, -0.24]
Soghikian 1992	200	0.10 (9.10)	190	1.70 (10.20)		11.5	-1.60 [-3.52, 0.32]
Vetter 2000	296	-13.20 (7.20)	326	-11.90 (6.90)		34.5	-1.30 [-2.41, -0.19]
Total (95% CI)	968		998			100.0	-2.03 [-2.69, -1.38]

Test for heterogeneity chi-square=18.40 df=11 p=0.07 I?? =40.2%

Test for overall effect z=6.10   p<0.00001

```
        -10.0   -5.0    0    5.0    10.0

        Favours treatment    Favours control
```

Analysis 01.03.   Comparison 01 Active intervention versus control, Outcome 03 Self monitoring (BP control)

Review: Interventions used to improve control of blood pressure in patients with hypertension

Comparison: 01 Active intervention versus control

Outcome: 03 Self monitoring (BP control)

Study	Treatment n/N	Control n/N	Odds Ratio (Fixed) 95% CI	Weight (%)	Odds Ratio (Fixed) 95% CI
Earp 1982	29/74	16/47		10.3	1.25 [0.58, 2.68]
Pierce 1984	15/55	7/29		5.8	1.18 [0.42, 3.32]
Rogers 2001	36/60	35/61		12.1	1.11 [0.54, 2.30]
Vetter 2000	100/296	131/326		71.8	0.76 [0.55, 1.05]
Total (95% CI)	485	463		100.0	0.88 [0.67, 1.15]

Total events: 180 (Treatment), 189 (Control)

Test for heterogeneity chi-square=2.30 df=3 p=0.51 I?? =0.0%

Test for overall effect z=0.96   p=0.3

```
        0.1  0.2   0.5   I    2    5   10
       Favours treatment     Favours control
```

Analysis 01.11.   Comparison 01 Active intervention versus control, Outcome 11 Patient education (systolic blood pressure)

Review: Interventions used to improve control of blood pressure in patients with hypertension

Comparison: 01 Active intervention versus control

Outcome: 11 Patient education (systolic blood pressure)

Study	Treatment N	Mean(SD)	Control N	Mean(SD)	Weighted Mean Difference (Fixed) 95% CI	Weight (%)	Weighted Mean Difference (Fixed) 95% CI
Billault 1995	82	-2.70 (16.50)	85	-1.60 (14.60)		18.0	-1.10 [-5.83, 3.63]
Burrelle 1986	8	-13.20 (16.00)	8	-5.80 (14.80)		1.8	-7.40 [-22.50, 7.70]
Fielding 1994	74	-10.90 (19.30)	71	-2.40 (19.50)		10.1	-8.50 [-14.82, -2.18]
Muhlhauser 1993	86	-8.00 (13.50)	74	-3.00 (13.90)		22.2	-5.00 [-9.26, -0.74]
Roca-Cusachs 1991	84	-16.70 (18.50)	111	-18.00 (21.60)		12.7	1.30 [-4.34, 6.94]
Watkins 1987	204	-0.20 (18.60)	210	-0.80 (18.60)		31.4	0.60 [-2.98, 4.18]
Zismer 1982	26	-13.10 (13.90)	13	2.60 (16.20)		3.8	-15.70 [-26.00, -5.40]
Total (95% CI)	564		572			100.0	-2.54 [-4.55, -0.53]

Test for heterogeneity chi-square=16.45 df=6 p=0.01 I?? =63.5%

Test for overall effect z=2.48   p=0.01

```
        -10.0   -5.0    0    5.0   10.0
       Favours treatment     Favours control
```

Analysis 01.12. Comparison 01 Active intervention versus control, Outcome 12 Patient education (diastolic blood pressure)

Review: Interventions used to improve control of blood pressure in patients with hypertension

Comparison: 01 Active intervention versus control

Outcome: 12 Patient education (diastolic blood pressure)

Study	Treatment N	Mean(SD)	Control N	Mean(SD)	Weighted Mean Difference (Fixed) 95% CI	Weight (%)	Weighted Mean Difference (Fixed) 95% CI
Billault 1995	82	1.30 (7.80)	85	-0.10 (11.20)		12.3	1.40 [-1.52, 4.32]
Burrelle 1986	8	-4.10 (11.90)	8	-11.20 (13.10)		0.7	7.10 [-5.16, 19.36]
Fielding 1994	74	-5.60 (9.70)	71	-1.70 (9.80)		10.4	-3.90 [-7.07, -0.73]
Muhlhauser 1993	86	-5.00 (7.30)	74	-2.00 (8.20)		17.8	-3.00 [-5.42, -0.58]
Roca-Cusachs 1991	84	-7.60 (9.50)	111	-9.50 (11.70)		11.8	1.90 [-1.08, 4.88]
Tanner 1981	15	-3.70 (6.90)	15	-3.90 (6.90)		4.3	0.20 [-4.74, 5.14]
Watkins 1987	204	0.30 (9.30)	210	-0.10 (9.30)		32.6	0.40 [-1.39, 2.19]
Webb 1980	37	-6.80 (9.00)	55	-3.50 (8.40)		7.8	-3.30 [-6.95, 0.35]
Zismer 1982	26	-8.20 (8.90)	13	0.50 (10.90)		2.2	-8.70 [-15.54, -1.86]
Total (95% CI)	616		642			100.0	-0.81 [-1.83, 0.21]

Test for heterogeneity chi-square=22.57 df=8 p=0.004 I?? =64.5%

Test for overall effect z=1.55 p=0.1

```
         -10.0  -5.0    0    5.0   10.0
        Favours treatment    Favours control
```

Analysis 01.13. Comparison 01 Active intervention versus control, Outcome 13 Patient education (BP control)

Review: Interventions used to improve control of blood pressure in patients with hypertension

Comparison: 01 Active intervention versus control

Outcome: 13 Patient education (BP control)

Study	Treatment n/N	Control n/N	Odds Ratio (Fixed) 95% CI	Weight (%)	Odds Ratio (Fixed) 95% CI
Earp 1982	14/41	16/47		17.9	1.00 [0.42, 2.43]
Morisky 1983	15/44	24/40		30.2	0.34 [0.14, 0.84]
Muhlhauser 1993	74/86	63/74		17.2	1.08 [0.44, 2.61]
Pierce 1984	10/59	9/27		18.7	0.41 [0.14, 1.17]
Sackett 1975	61/80	26/32		16.1	0.74 [0.27, 2.07]
Total (95% CI)	310	220		100.0	0.66 [0.44, 1.01]

Total events: 174 (Treatment), 138 (Control)

Test for heterogeneity chi-square=4.95 df=4 p=0.29 I?? =19.2%

Test for overall effect z=1.93 p=0.05

```
      0.1  0.2   0.5   1    2    5   10
     Favours treatment    Favours control
```

Analysis 01.21. Comparison 01 Active intervention versus control, Outcome 21 Physician education (systolic blood pressure)

Review: Interventions used to improve control of blood pressure in patients with hypertension

Comparison: 01 Active intervention versus control

Outcome: 21 Physician education (systolic blood pressure)

Study	Treatment N	Treatment Mean(SD)	Control N	Control Mean(SD)	Weighted Mean Difference (Fixed) 95% CI	Weight (%)	Weighted Mean Difference (Fixed) 95% CI
Coe 1977	60	-19.50 (21.10)	56	-18.30 (27.00)		2.5	-1.20 [-10.06, 7.66]
Dickinson 1981	78	-10.00 (20.90)	33	-11.00 (23.80)		2.3	1.00 [-8.35, 10.35]
Evans 1986	102	-12.20 (13.70)	81	-13.00 (19.60)		7.9	0.80 [-4.23, 5.83]
Hetlevik 1999	816	-2.30 (19.10)	1023	-0.80 (18.30)		66.9	-1.50 [-3.22, 0.22]
Montgomery 2000	199	-3.00 (18.10)	130	1.00 (20.30)		10.8	-4.00 [-8.30, 0.30]
Sanders 2002	135	-7.10 (18.50)	126	-0.30 (18.90)		9.6	-6.80 [-11.34, -2.26]
Total (95% CI)	1390		1449			100.0	-2.03 [-3.45, -0.62]

Test for heterogeneity chi-square=7.06 df=5 p=0.22 I²? =29.2%

Test for overall effect z=2.83 p=0.005

-10.0 -5.0 0 5.0 10.0

Favours treatment   Favours control

Analysis 01.22. Comparison 01 Active intervention versus control, Outcome 22 Physician education (diastolic blood pressure)

Review: Interventions used to improve control of blood pressure in patients with hypertension

Comparison: 01 Active intervention versus control

Outcome: 22 Physician education (diastolic blood pressure)

Study	Treatment N	Treatment Mean(SD)	Control N	Control Mean(SD)	Weighted Mean Difference (Fixed) 95% CI	Weight (%)	Weighted Mean Difference (Fixed) 95% CI
Coe 1977	60	-13.40 (13.20)	56	-14.50 (12.80)		2.1	1.10 [-3.63, 5.83]
Dickinson 1981	78	-5.00 (13.90)	33	-4.00 (14.70)		1.4	-1.00 [-6.89, 4.89]
Evans 1986	102	1.00 (6.90)	81	0.70 (8.60)		9.1	0.30 [-2.00, 2.60]
Hetlevik 1999	816	-1.80 (9.30)	1023	-1.20 (8.50)		70.8	-0.60 [-1.42, 0.22]
Montgomery 2000	199	-1.00 (9.10)	130	-2.00 (10.40)		10.0	1.00 [-1.19, 3.19]
Sanders 2002	135	-3.40 (10.80)	126	-1.30 (11.50)		6.5	-2.10 [-4.81, 0.61]
Total (95% CI)	1390		1449			100.0	-0.43 [-1.12, 0.27]

Test for heterogeneity chi-square=4.08 df=5 p=0.54 I²? =0.0%

Test for overall effect z=1.20 p=0.2

-10.0 -5.0 0 5.0 10.0

Favours treatment   Favours control
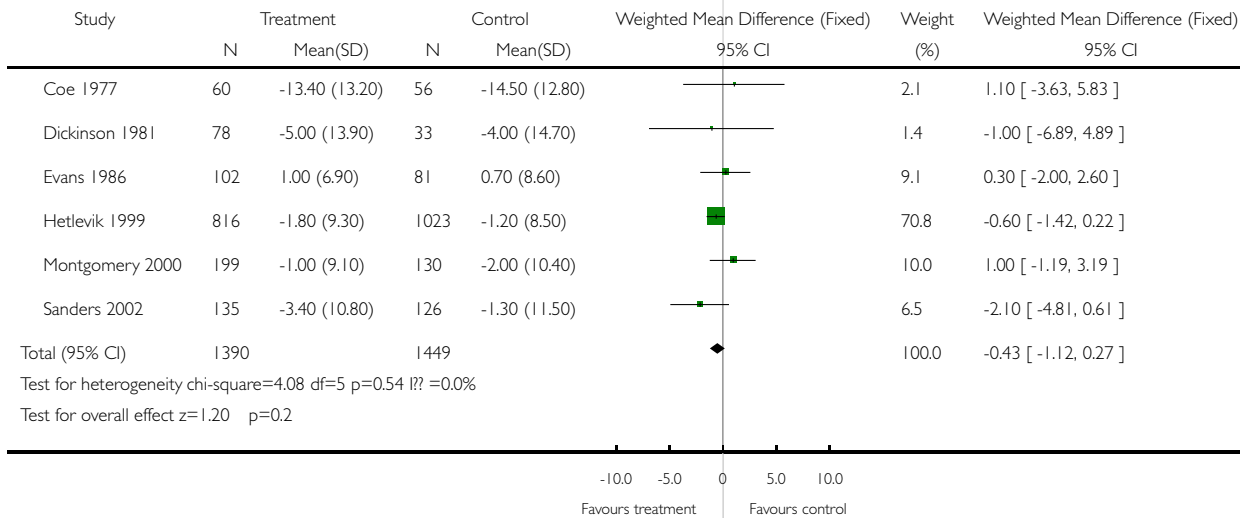
Analysis 01.23. Comparison 01 Active intervention versus control, Outcome 23 Physician education (BP control)

Review: Interventions used to improve control of blood pressure in patients with hypertension

Comparison: 01 Active intervention versus control

Outcome: 23 Physician education (BP control)

Study	Treatment n/N	Control n/N	Odds Ratio (Fixed) 95% CI	Weight (%)	Odds Ratio (Fixed) 95% CI
Dickinson 1981	14/78	3/16		0.2	0.95 [0.24, 3.78]
Evans 1986	42/102	37/81		1.4	0.83 [0.46, 1.50]
McAlister 1986	35/319	35/283		1.8	0.87 [0.53, 1.44]
Montgomery 2000	120/199	77/130		2.1	1.05 [0.67, 1.64]
New 2004	1282/2474	1319/2531		35.0	0.99 [0.88, 1.10]
Ornstein 2004	1850/4446	1600/3326		59.5	0.77 [0.70, 0.84]
Total (95% CI)	7618	6367		100.0	0.85 [0.80, 0.91]

Total events: 3343 (Treatment), 3071 (Control)

Test for heterogeneity chi-square=12.66 df=5 p=0.03 I?? =60.5%

Test for overall effect z=4.53   p<0.00001

```
       0.1  0.2   0.5   1    2    5   10
          Favours treatment   Favours control
```
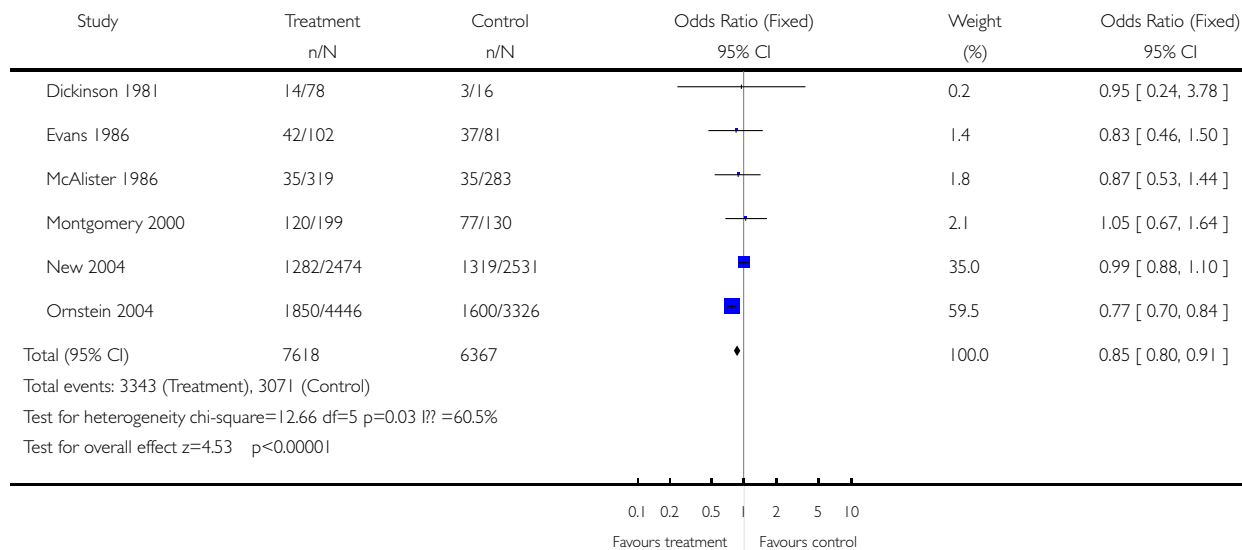
Analysis 01.31. Comparison 01 Active intervention versus control, Outcome 31 Health professional led care (systolic blood pressure)

Review: Interventions used to improve control of blood pressure in patients with hypertension

Comparison: 01 Active intervention versus control

Outcome: 31 Health professional led care (systolic blood pressure)

Study	N	Treatment Mean(SD)	N	Control Mean(SD)	Weighted Mean Difference (Fixed) 95% CI	Weight (%)	Weighted Mean Difference (Fixed) 95% CI
Bogden 1998	49	-23.00 (22.60)	46	-11.00 (20.00)		2.9	-12.00 [-20.57, -3.43]
Garcia-Pena 2001	345	-6.80 (17.40)	338	-3.50 (17.00)		31.9	-3.30 [-5.88, -0.72]
Hawkins 1979	349	-2.00 (14.10)	280	-2.00 (10.70)		56.6	0.00 [-1.94, 1.94]
Park 1996	23	-12.30 (15.80)	27	0.70 (18.80)		2.3	-13.00 [-22.59, -3.41]
Solomon 2002	63	-8.20 (15.20)	70	-1.30 (19.00)		6.3	-6.90 [-12.72, -1.08]
Total (95% CI)	829		761			100.0	-2.14 [-3.59, -0.68]

Test for heterogeneity chi-square=18.03 df=4 p=0.001 I?? =77.8%

Test for overall effect z=2.87   p=0.004

```
     -10.0   -5.0    0    5.0   10.0
       Favours treatment   Favours control
```

Analysis 01.32.   Comparison 01 Active intervention versus control, Outcome 32 Health professional led care (diastolic blood pressure)

Review: Interventions used to improve control of blood pressure in patients with hypertension

Comparison: 01 Active intervention versus control

Outcome: 32 Health professional led care (diastolic blood pressure)
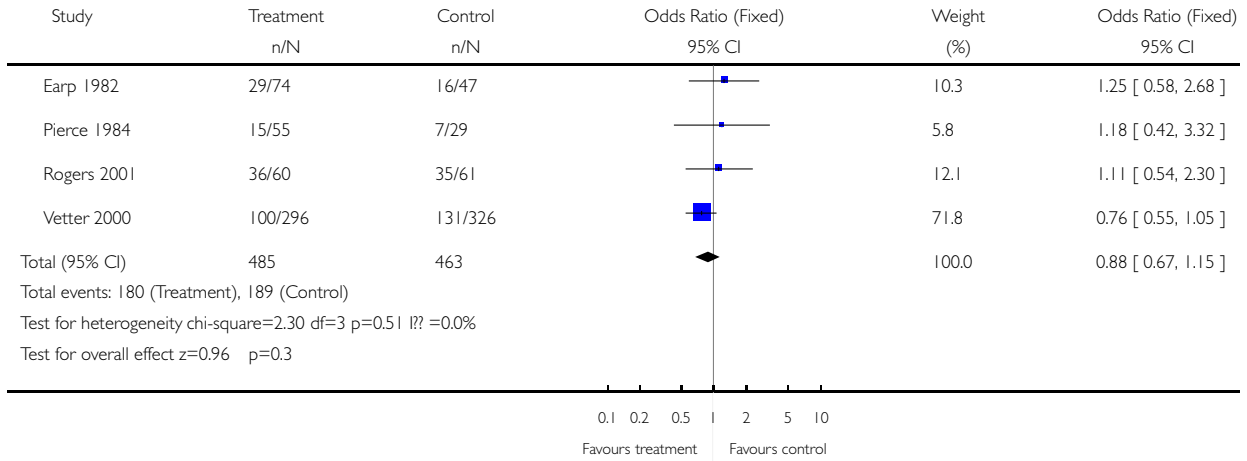
Study	Treatment N	Treatment Mean(SD)	Control N	Control Mean(SD)	Weighted Mean Difference (Fixed) 95% CI	Weight (%)	Weighted Mean Difference (Fixed) 95% CI
Bogden 1998	49	-11.00 (9.40)	46	-3.00 (10.20)		2.0	-8.00 [-11.95, -4.05]
Garcia-Pena 2001	345	-3.70 (9.20)	338	0.00 (9.60)		16.0	-3.70 [-5.11, -2.29]
Hawkins 1979	349	-2.00 (5.30)	280	-2.00 (4.00)		60.2	0.00 [-0.73, 0.73]
Logan 1979	206	-10.00 (6.40)	204	-6.10 (7.20)		18.3	-3.90 [-5.22, -2.58]
Park 1996	23	-4.60 (8.50)	27	0.40 (9.30)		1.3	-5.00 [-9.94, -0.06]
Solomon 2002	63	-4.40 (11.40)	70	-3.80 (11.00)		2.2	-0.60 [-4.42, 3.22]
Total (95% CI)	1035		965			100.0	-1.55 [-2.11, -0.98]

Test for heterogeneity chi-square=50.92 df=5 p=<0.0001 I?? =90.2%

Test for overall effect z=5.37   p<0.00001

```
        -10.0   -5.0    0     5.0    10.0
      Favours treatment      Favours control
```
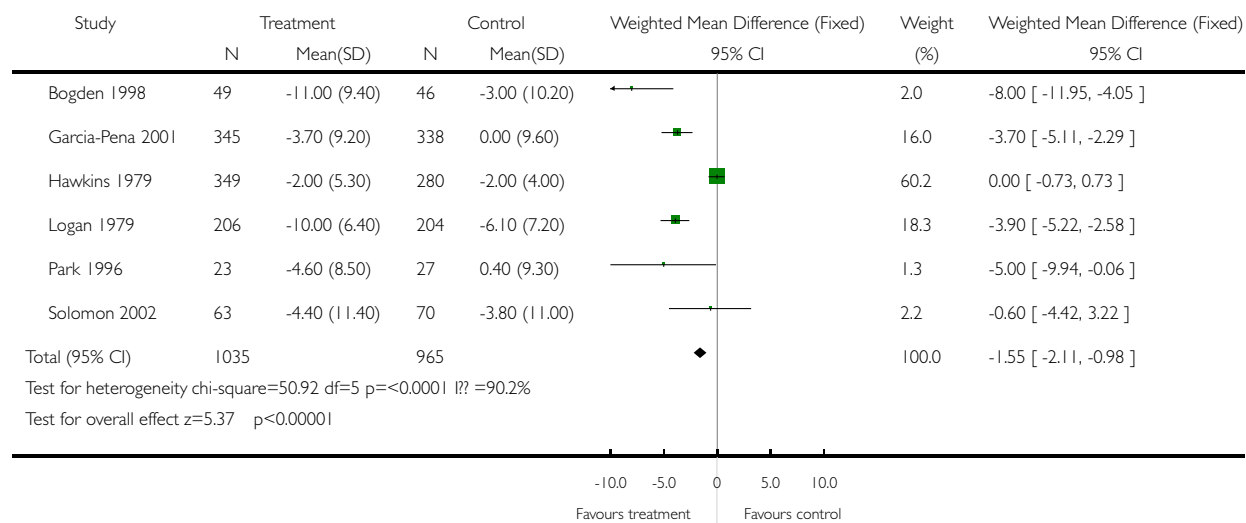
Analysis 01.33.   Comparison 01 Active intervention versus control, Outcome 33 Health professional led care (BP control)

Review: Interventions used to improve control of blood pressure in patients with hypertension

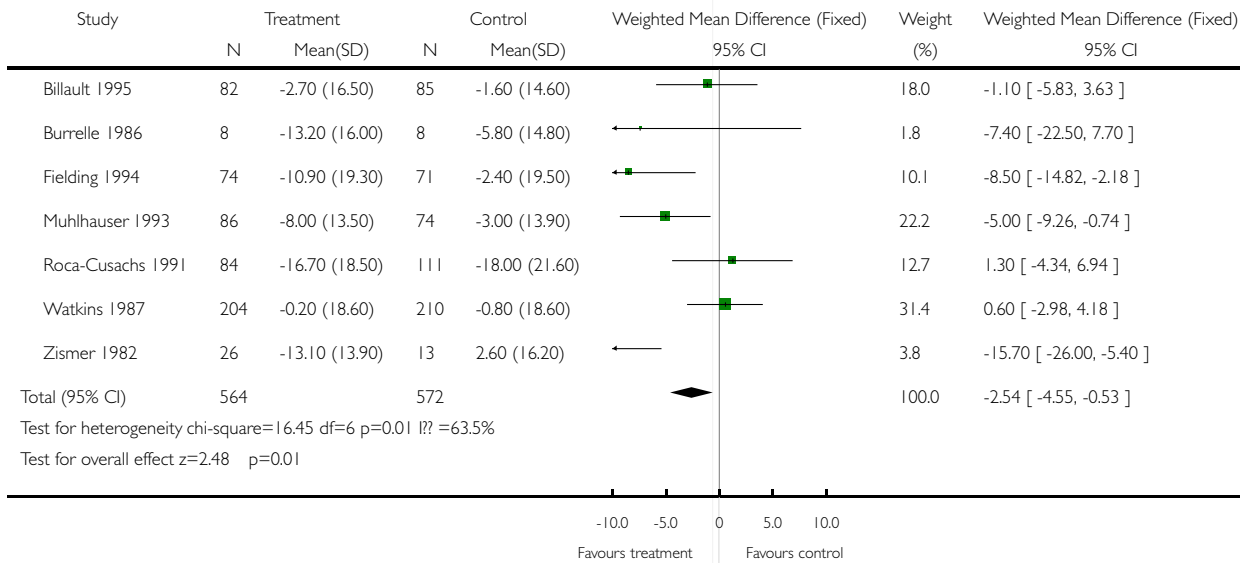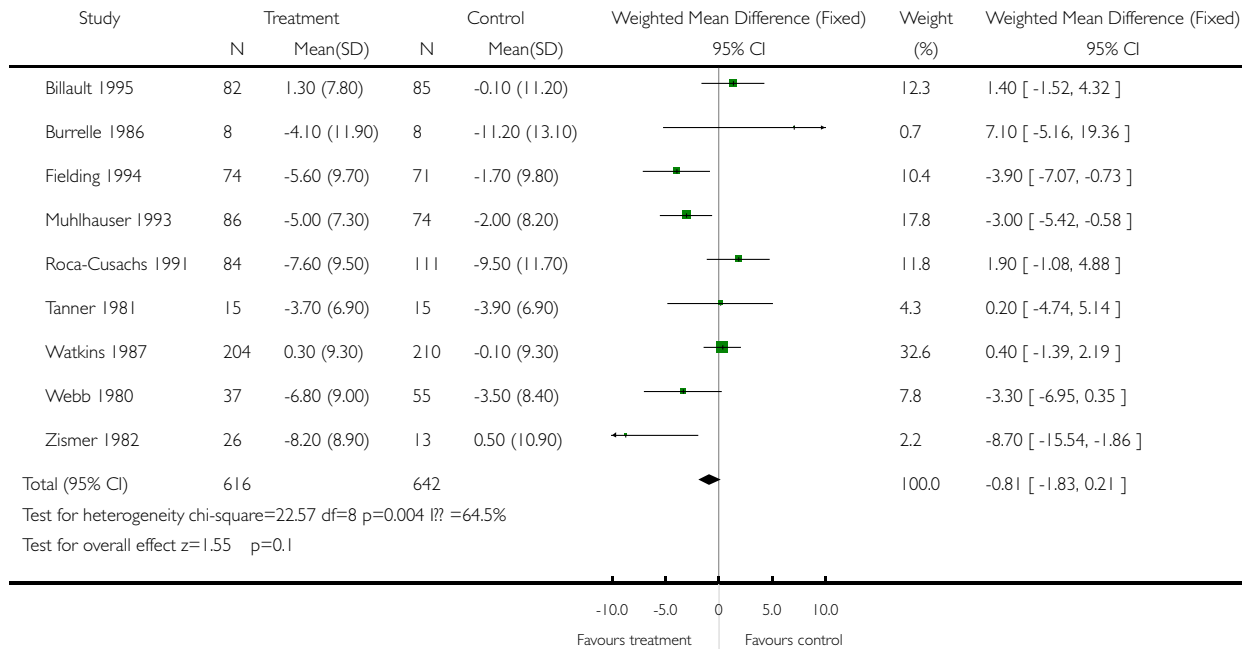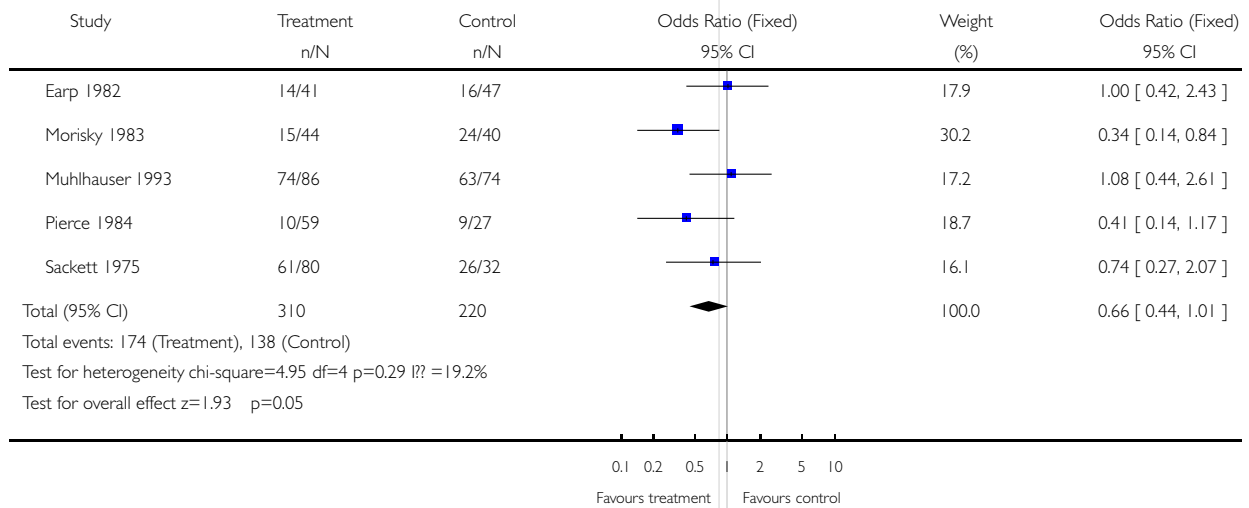Comparison: 01 Active intervention versus control

Outcome: 33 Health professional led care (BP control)

Study	Treatment n/N	Control n/N	Odds Ratio (Fixed) 95% CI	Weight (%)	Odds Ratio (Fixed) 95% CI
Bogden 1998	22/49	37/46		9.4	0.20 [0.08, 0.50]
Garcia-Pena 2001	220/345	316/338		51.7	0.12 [0.08, 0.20]
Jewell 1988	5/15	7/19		1.8	0.86 [0.21, 3.55]
Logan 1979	102/204	146/206		32.5	0.41 [0.27, 0.62]
Park 1996	11/23	21/26		4.6	0.22 [0.06, 0.78]
Total (95% CI)	636	635		100.0	0.24 [0.18, 0.32]

Total events: 360 (Treatment), 527 (Control)

Test for heterogeneity chi-square=17.34 df=4 p=0.002 I?? =76.9%

Test for overall effect z=10.19   p<0.00001

```
     0.1  0.2   0.5   1    2    5   10
    Favours treatment      Favours control
```

Analysis 01.41.   Comparison 01 Active intervention versus control, Outcome 41 Organisation/protocol driven care (systolic blood pressure)

Review: Interventions used to improve control of blood pressure in patients with hypertension

Comparison: 01 Active intervention versus control
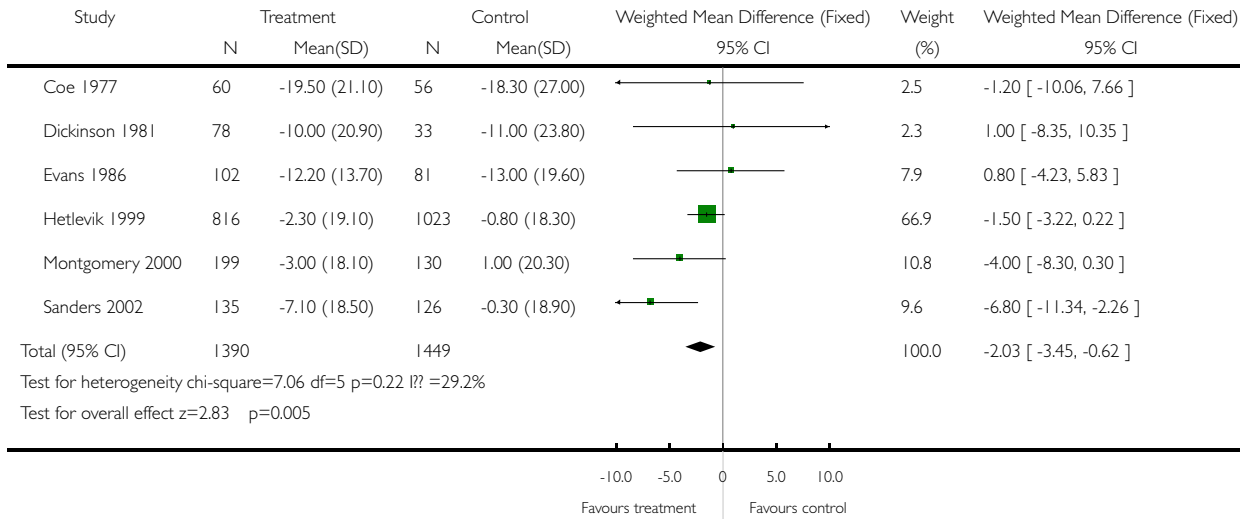
Outcome: 41 Organisation/protocol driven care (systolic blood pressure)

Study	Treatment		Control		Weighted Mean Difference (Fixed)	Weight	Weighted Mean Difference (Fixed)
	N	Mean(SD)	N	Mean(SD)	95% CI	(%)	95% CI
Bulpitt 1976	80	-28.80 (17.60)	71	-28.40 (17.10)		2.3	-0.40 [-5.94, 5.14]
Dickinson 1981	51	-12.00 (19.70)	33	-11.00 (23.80)		0.8	-1.00 [-10.76, 8.76]
Hypertension 1979	2872	-23.60 (16.20)	1718	-15.40 (17.50)		69.2	-8.20 [-9.22, -7.18]
Hypertension 1979a	811	-38.90 (17.50)	542	-27.20 (18.60)		18.4	-11.70 [-13.68, -9.72]
Hypertension 1982	438	-52.30 (21.90)	311	-41.70 (21.40)		7.3	-10.60 [-13.74, -7.46]
Takala 1979	39	-26.00 (18.40)	36	-29.00 (17.50)		1.1	3.00 [-5.13, 11.13]
Takala 1983	36	-35.00 (18.50)	34	-38.00 (18.00)		1.0	3.00 [-5.55, 11.55]
Total (95% CI)	4327		2745			100.0	-8.55 [-9.40, -7.70]

Test for heterogeneity chi-square=37.24 df=6 p=<0.0001 I?? =83.9%

Test for overall effect z=19.79   p<0.00001

```
        -10.0   -5.0    0    5.0   10.0
     Favours treatment      Favours control
```

Analysis 01.42.   Comparison 01 Active intervention versus control, Outcome 42 Organisation/protocol driven care (diastolic blood pressure)

Review: Interventions used to improve control of blood pressure in patients with hypertension

Comparison: 01 Active intervention versus control

Outcome: 42 Organisation/protocol driven care (diastolic blood pressure)

Study	Treatment		Control		Weighted Mean Difference (Fixed)	Weight	Weighted Mean Difference (Fixed)
	N	Mean(SD)	N	Mean(SD)	95% CI	(%)	95% CI
Bulpitt 1976	80	-9.20 (8.80)	71	-9.40 (8.50)		2.0	0.20 [-2.56, 2.96]
Dickinson 1981	51	-6.00 (9.90)	33	-4.00 (14.70)		0.5	-2.00 [-7.70, 3.70]
Hypertension 1979	2872	-10.90 (7.30)	1718	-6.70 (8.10)		71.0	-4.20 [-4.67, -3.73]
Hypertension 1979a	811	-20.80 (7.20)	542	-14.30 (9.00)		18.9	-6.50 [-7.41, -5.59]
Hypertension 1982	438	-30.50 (9.80)	311	-22.90 (12.20)		5.8	-7.60 [-9.24, -5.96]
Takala 1979	39	-12.00 (9.20)	36	-15.00 (8.70)		0.9	3.00 [-1.05, 7.05]
Takala 1983	36	-11.00 (9.20)	34	-16.00 (9.00)		0.9	5.00 [0.74, 9.26]
Total (95% CI)	4327		2745			100.0	-4.58 [-4.98, -4.19]

Test for heterogeneity chi-square=78.02 df=6 p=<0.0001 I?? =92.3%

Test for overall effect z=22.84   p<0.00001

```
        -10.0   -5.0    0    5.0   10.0
     Favours treatment      Favours control
```
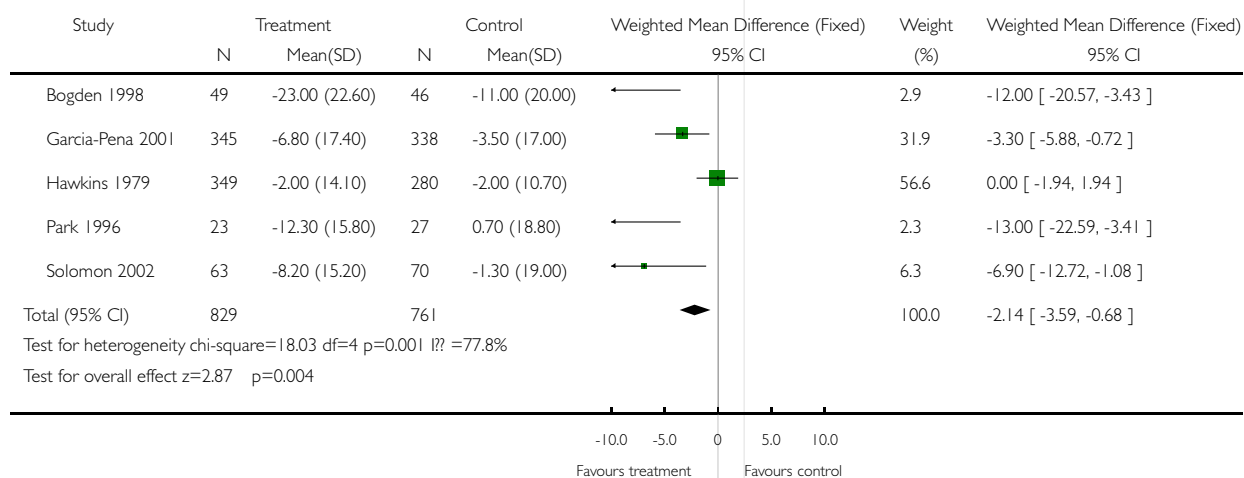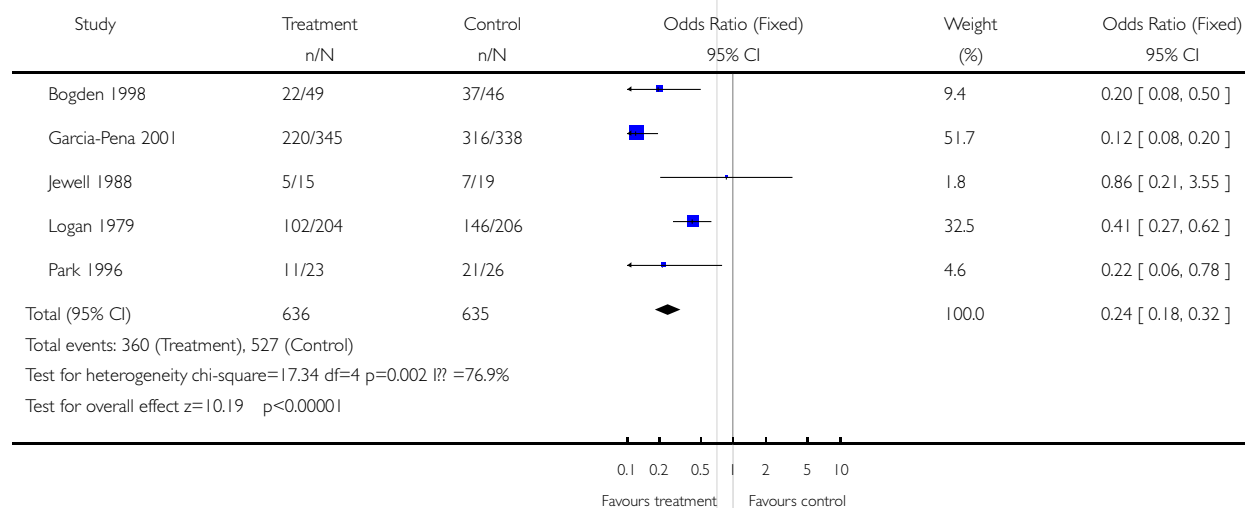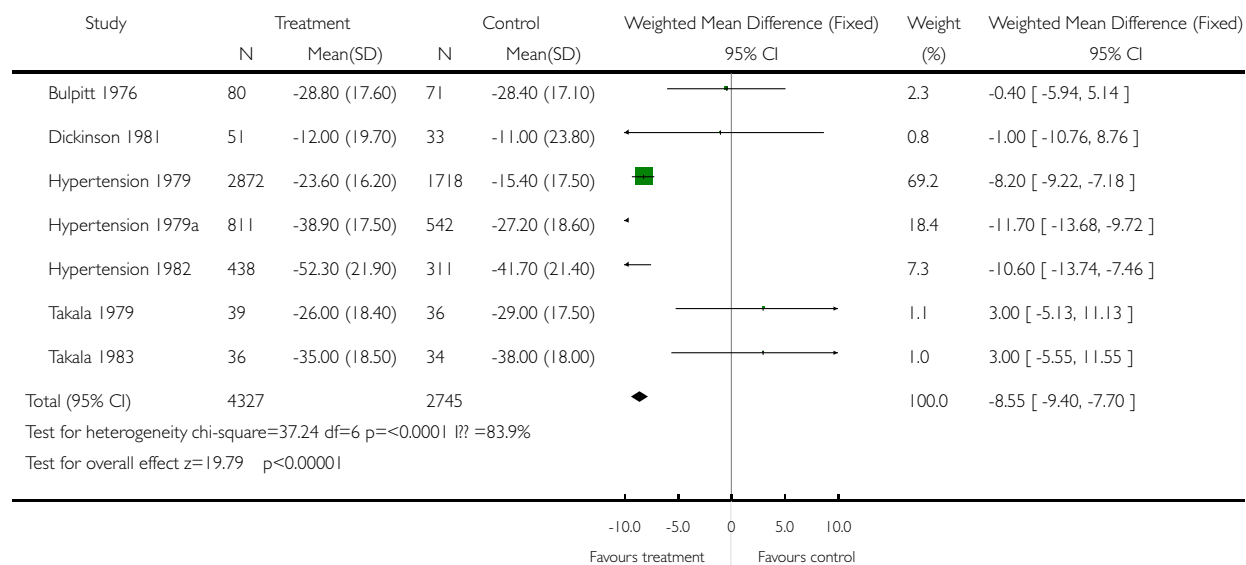
Analysis 01.43.   Comparison 01 Active intervention versus control, Outcome 43 Organisation/protocol driven care

Review: Interventions used to improve control of blood pressure in patients with hypertension

Comparison: 01 Active intervention versus control
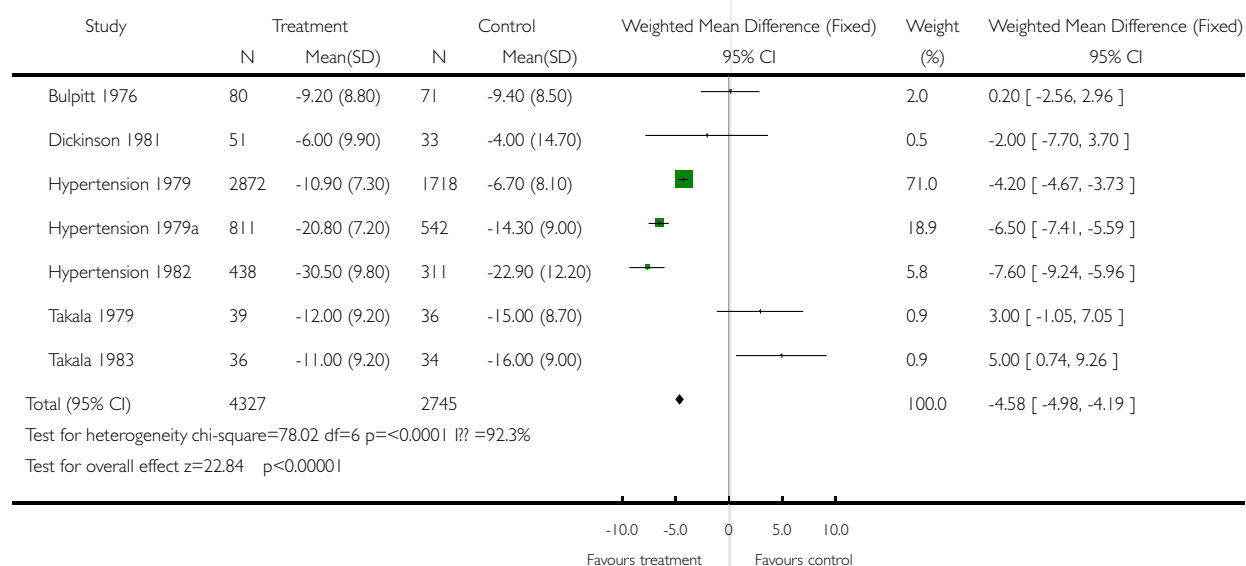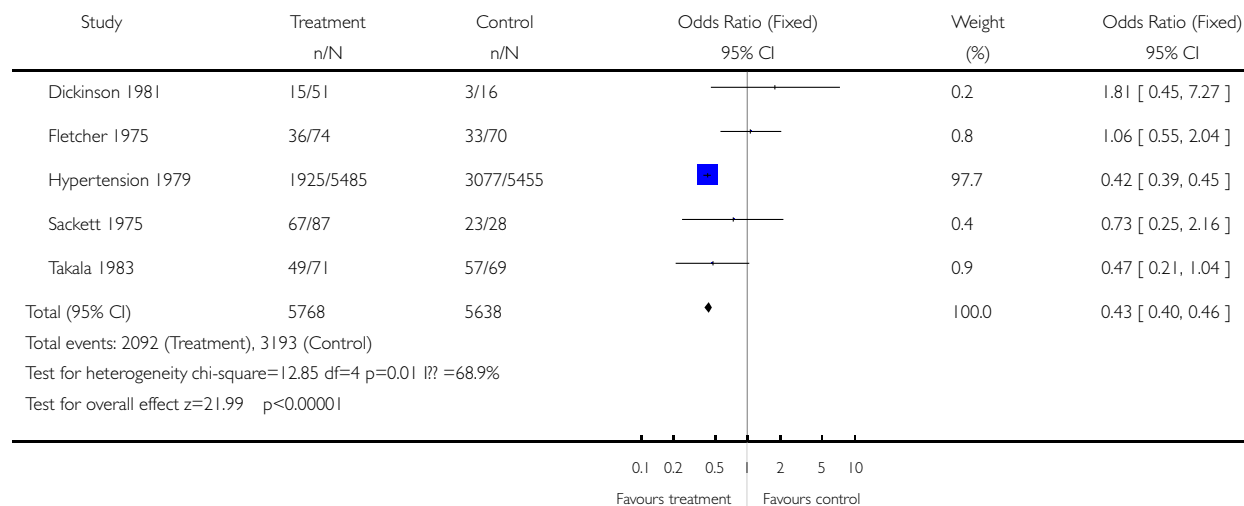
Outcome: 43 Organisation/protocol driven care

Study	Treatment n/N	Control n/N	Odds Ratio (Fixed) 95% CI	Weight (%)	Odds Ratio (Fixed) 95% CI
Dickinson 1981	15/51	3/16		0.2	1.81 [0.45, 7.27]
Fletcher 1975	36/74	33/70		0.8	1.06 [0.55, 2.04]
Hypertension 1979	1925/5485	3077/5455		97.7	0.42 [0.39, 0.45]
Sackett 1975	67/87	23/28		0.4	0.73 [0.25, 2.16]
Takala 1983	49/71	57/69		0.9	0.47 [0.21, 1.04]
Total (95% CI)	5768	5638		100.0	0.43 [0.40, 0.46]

Total events: 2092 (Treatment), 3193 (Control)

Test for heterogeneity chi-square=12.85 df=4 p=0.01 I?? =68.9%

Test for overall effect z=21.99   p<0.00001

```
         0.1  0.2   0.5   1    2    5   10
        Favours treatment    Favours control
```

Analysis 01.51.   Comparison 01 Active intervention versus control, Outcome 51 Appointment reminder (appointment interventions) (outcome: lost to follow up at clinic)

Review: Interventions used to improve control of blood pressure in patients with hypertension

Comparison: 01 Active intervention versus control

Outcome: 51 Appointment reminder (appointment interventions) (outcome: lost to follow up at clinic)

Study	Treatment n/N	Control n/N	Odds Ratio (Fixed) 95% CI	Weight (%)	Odds Ratio (Fixed) 95% CI
Ahluwalia 1996	8/53	6/54		2.2	1.42 [0.46, 4.42]
Barnett 1983	1/63	28/52		13.0	0.01 [0.00, 0.11]
Bloom 1979	12/27	20/27		4.8	0.28 [0.09, 0.88]
Cummings 1985	70/486	129/487		47.4	0.47 [0.34, 0.65]
Fletcher 1975	12/74	26/70		9.6	0.33 [0.15, 0.72]
Krieger 1999	51/146	88/165		23.1	0.47 [0.30, 0.74]
Total (95% CI)	849	855		100.0	0.41 [0.32, 0.51]

Total events: 154 (Treatment), 297 (Control)

Test for heterogeneity chi-square=16.91 df=5 p=0.005 I?? =70.4%

Test for overall effect z=7.66   p<0.00001

```
         0.1  0.2   0.5   1    2    5   10
        Favours treatment    Favours control
```