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

Fahey T, Schroeder K, Ebrahim S
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A B S T R A C T

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/
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; 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; Burrell 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 -15.7 mmHg 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 heterogeneous 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 systematic 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 1986; Davis 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 (Elbrahim 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;
Supplementary and alternative models of care, including self monitoring of blood pressure by patients, blood pressure management by allied health care professionals and CDSRs 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

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McAlister NH, Covvey HD, Tong C, Lee A, Wigle ED. Randomised controlled trial of computer assisted management of hypertension in
Interventions used to improve control of blood pressure in patients with hypertension (Review)}

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Vetter 2000 [published data only]

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References to studies excluded from this review

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Girvin 1999

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Gonzalez-Fernandez

Grimm

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Iso 1996

Iso H

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Phaley 1995

Putnam 1989

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Statson 1977

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Trocha 1998

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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

Sullivan

Zarnke
Not known. Ongoing study Not known.

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Davis 2001

Du 1997

Ebrahim 1998

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Payne 1993

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

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Staessen 2004

Warsi 2004

Weingarten 2002

Wilber 1972

*Indicates the major publication for the study

**TABLES**

**Characteristics of included studies**

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<tr>
<th>Study</th>
<th>Ahluwalia 1996</th>
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</thead>
<tbody>
<tr>
<td><strong>Methods</strong></td>
<td>Parallel, individuals, hospital outpatients in a single hospital clinic, USA</td>
</tr>
<tr>
<td><strong>Participants</strong></td>
<td>Hypertensive (SBP 180mmHg and/or DBP 110mmHg), 95% African American, 49% uninsured, mean age 56</td>
</tr>
<tr>
<td><strong>Interventions</strong></td>
<td>(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</td>
</tr>
<tr>
<td><strong>Outcomes</strong></td>
<td>(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%</td>
</tr>
</tbody>
</table>
### Characteristics of included studies (Continued)

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<thead>
<tr>
<th>Study</th>
<th>Notes</th>
<th>Allocation concealment</th>
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<tbody>
<tr>
<td><strong>Duration of FU 6 months</strong></td>
<td>No blood pressure data collected at outcome</td>
<td>B</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Study</th>
<th>Methods</th>
<th>Participants</th>
<th>Interventions</th>
<th>Outcomes</th>
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</thead>
<tbody>
<tr>
<td><strong>Artinian 2001</strong></td>
<td>Pilot RCT</td>
<td>Age &gt;18 years, SBP &gt;140mmHg or &gt;90mmHg or for diabetic patients &gt;130mmHg or &gt;85mmHg</td>
<td>(1) Home BP telemonitoring- self monitoring at home and transmitting BP readings over telephone line to care providers in order to &quot;facilitate telecounselling and treatment planning&quot;. BP readings transmitted 3 times per week for 12 weeks. (2) Nurse-managed community based BP monitoring. (3) Usual care</td>
<td>(1) Blood pressure- mean change SBP 25 mmHg, mean change DBP 14mmHg (E) versus mean change SBP +1 mmHg, mean change DBP 2mmHg</td>
</tr>
<tr>
<td><strong>Bailey 1998</strong></td>
<td>Parallel, individuals based in general practitioner surgeries, Australia</td>
<td>Patients who were about to start BP lowering treatment who did not practice self-measurement, &lt;7% previously untreated, mean age 53.5 years.</td>
<td>(1) Self monitoring- use of an OMRON HEM706 monitor. Asked to record BP twice daily for 8 weeks (2) Usual care- no self recording</td>
<td>(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</td>
</tr>
<tr>
<td><strong>Barnett 1983</strong></td>
<td>Parallel, individuals based in one community-based health centre in USA.</td>
<td>Physicians (numbers not stated). Patients (n= 115) with sustained hypertension and/or diagnosis of hypertension and placed on therapy, &lt;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</td>
<td></td>
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</tr>
</tbody>
</table>
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

Participants 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

Participants
Patients with increased blood pressure, either:
150 or 95mmHg
140 or 90mmHg with CVS risk factors or target organ damage
Mean age 55 sd 13, 25% mixed Hawaiian 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 51 years, mean lying BP 178/105 mmHg; control group: 53% female, mean age 48 years, mean lying BP 177/106 mmHg |
| 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) 149/96 mmHg (C) 149/97 mmHg |
| Notes | Duration of FU 12 months. |

Study | Burrelle 1986 |
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Methods</td>
<td>Parallel, individuals, hospital outpatients and primary care, USA</td>
</tr>
<tr>
<td>Participants</td>
<td>16 treated and non-adherent elderly hypertensive patients, 75% black, 75% women, mean age 69.</td>
</tr>
<tr>
<td>Interventions</td>
<td>(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</td>
</tr>
<tr>
<td>Outcomes</td>
<td>(1) Blood pressure control - no difference between groups, (E) 167.8/89.2 mmHg versus (C) 165.8/86.8 mmHg (2) Compliance (Pill counts and direct questioning, taking &gt;80% of medication) - Percent of pills taken: 92% (E) versus 71% (C) (p&lt;0.001) (3) % with controlled hypertension, no difference, (E) 1/8, 13% versus (C) 1/8, 13%</td>
</tr>
<tr>
<td>Notes</td>
<td>Very small and underpowered study</td>
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</table>

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

Study | Coe 1977 |
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<tr>
<th></th>
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<tbody>
<tr>
<td>Methods</td>
<td>Parallel, individuals based in 2 hospital hypertension clinics in US</td>
</tr>
</tbody>
</table>
**Characteristics of included studies (Continued)**

| Participants | Hospital physicians  
|--------------|----------------------  
| (number not stated) | 116 patients, 90.5% female, mean age 52 years, 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 not 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 œ/= 140/90; 45-64 œ/=150/95; age œ64 œ/=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  

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*Interventions used to improve control of blood pressure in patients with hypertension (Review)  
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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 148/84mmHg, control 148/83
(4) % with controlled hypertension- non significant differences, feedback 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

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

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

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)

<table>
<thead>
<tr>
<th>Study</th>
<th>Fielding 1994</th>
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</thead>
<tbody>
<tr>
<td><strong>Methods</strong></td>
<td>Parallel, individuals at four work sites in the US</td>
</tr>
<tr>
<td><strong>Participants</strong></td>
<td>Patients with increased blood pressure, either: SBP 140 and/or DBP 90mmHg identified during work-site screening. 16% female, 30.5% taking BP lowering drugs</td>
</tr>
<tr>
<td><strong>Interventions</strong></td>
<td>(1) IMPACT consisted of monthly 10 minute individual sessions for patients with counsellor at work site that included: &quot;Assessment of current behaviours &quot;Discussion re: treatment goals &quot;Compliance &quot;Mailed monthly package including personalised blood pressure information &quot;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</td>
</tr>
<tr>
<td><strong>Outcomes</strong></td>
<td>(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&lt;0.05 DBP 2.4mmHg, NS</td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td>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%</td>
</tr>
<tr>
<td><strong>Allocation concealment</strong></td>
<td>B</td>
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<table>
<thead>
<tr>
<th>Study</th>
<th>Fletcher 1975</th>
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</thead>
<tbody>
<tr>
<td><strong>Methods</strong></td>
<td>Parallel, individuals based in single emergency room in US</td>
</tr>
<tr>
<td><strong>Participants</strong></td>
<td>Patients who attended emergency department with DBP 100mmHg and who had been given a follow up appointment for a medical clinic</td>
</tr>
<tr>
<td><strong>Interventions</strong></td>
<td>(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</td>
</tr>
<tr>
<td><strong>Outcomes</strong></td>
<td>(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%)</td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td>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 &lt;140/90 40-59 &lt;150/95 &gt;60 &lt;160/100</td>
</tr>
<tr>
<td><strong>Allocation concealment</strong></td>
<td>B</td>
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<thead>
<tr>
<th>Study</th>
<th>Friedman 1996</th>
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<tbody>
<tr>
<td><strong>Methods</strong></td>
<td>Parallel, individuals from 29 different communities, Boston, USA</td>
</tr>
</tbody>
</table>

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

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

<table>
<thead>
<tr>
<th>Participants</th>
<th>Under care of physician for hypertension on BP lowering drugs, SBP ≥160 mmHg or DBP ≥90 mmHg on average two readings. 90% white, 77% female, mean age 76 years</th>
</tr>
</thead>
</table>
| 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) 158.5 mmHg versus (C) 156.4 mmHg, p=0.2; significant difference for DBP, (E) 80.9 mmHg versus (C) 83.2 mmHg, p=0.02;  
  (3) Cost effectiveness- most cost effective for non-adherent patients |
| 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 institute's clinic and mailed pamphlet about hypertension |
| Outcomes | (1) Blood pressure- mean change SBP 3.31 mmHg p=0.03, mean change DBP 3.67 mmHg p<0.001  
  (2) Weight-1.1 kg significantly reduced  
  (3) Sodium excretion -5.8 ns  
  (4) Control BP <160/90 mmHg 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 |
| 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.

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<th>Allocation concealment</th>
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**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.

<table>
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<th>Allocation concealment</th>
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</table>

**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 29.18 in intervention group vs 23.92 in control group (p=0.005)

**Duration of FU** 6 months.
### Characteristics of included studies (Continued)

<table>
<thead>
<tr>
<th>Study</th>
<th>Method</th>
<th>Participants</th>
<th>Interventions</th>
<th>Outcomes</th>
<th>Notes</th>
</tr>
</thead>
</table>
| Hawkins 1979   | Parallel   | 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) | (1) Clinical pharmacist- chronic disease management in OPD setting (medical care monitored by family practice faculty)  
(2) Usual care by physician | (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<0.005)  
(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. | 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 |
|                |            |                                                                              |                                                                                                         | Duration FU 24-29 months                                                                                   |                                                                                                               |
| Haynes 1976    | Parallel   | 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) | (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 | (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 | (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 |
|                |            |                                                                              |                                                                                                         | Duration of FU 1 year.                                                                                   |                                                                                                               |
### Study Characteristics (Continued)

**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

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**Study**

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**Methods**
Cluster (29 health centres, 53 family practitioners), analysed by patient (2239 patients). Two regions in Norway.

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- (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

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**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%)

**Notes**
No SBP entry criteria and no upper limits of BP

**Allocation concealment**
B
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, paramedical 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.
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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.
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(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%
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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 4 and 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 90-99 mmHg.

Mortality FU 5 years, mean BP data reported at 1 year and 5 years
### Characteristics of included studies (Continued)

<table>
<thead>
<tr>
<th>Study</th>
<th>Hypertension 1982</th>
</tr>
</thead>
<tbody>
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<td><strong>Notes</strong></td>
<td>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%</td>
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</table>
### 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 4 and 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.

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### 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.
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   1. Stratum i- 90-104 mmHg, n= 7,825 (71.5%)
   2. Stratum ii- 105-114 mmHg, n=2,052 (18.8%)
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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%  
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Total drug status known at 1 year, 82.4% SC v 82.8% RC  
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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

#### Study

<table>
<thead>
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<th>Jewell 1988</th>
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<tbody>
<tr>
<td><strong>Methods</strong></td>
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</table>
| **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** |

#### Study

<table>
<thead>
<tr>
<th>Johnson 1978</th>
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<td><strong>Methods</strong></td>
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### Characteristics of included studies (Continued)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Details</th>
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<tbody>
<tr>
<td><strong>Participants</strong></td>
<td>Sceenees 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)</td>
</tr>
<tr>
<td><strong>Interventions</strong></td>
<td>(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.</td>
</tr>
<tr>
<td><strong>Outcomes</strong></td>
<td>(1) Changes in mean DBP- no difference. (2) Changes in mean compliance- no difference. (3) Changes mean compliance in those with initial compliance &lt;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.</td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td>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.</td>
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<td><strong>Allocation concealment</strong></td>
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### Study: Krieger 1999

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Details</th>
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<tbody>
<tr>
<td><strong>Methods</strong></td>
<td>Parallel, individuals in a single “low income” area of Seattle, USA.</td>
</tr>
<tr>
<td><strong>Participants</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Interventions</strong></td>
<td>(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.</td>
</tr>
<tr>
<td><strong>Outcomes</strong></td>
<td>(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.</td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td>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.</td>
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### Study: Levine 1979

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<thead>
<tr>
<th>Characteristics</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Methods</strong></td>
<td>Factorial trial with 8 groups of various combinations of the 3 interventions and control individuals at two hypertension clinics in US.</td>
</tr>
<tr>
<td><strong>Participants</strong></td>
<td>91% black, median age 54 years, 70% female, low income ($45250 median yearly income). BP (mmHg) entry criteria based on age: 20-39: &gt;140/90, 40-59: &gt;150/95, 60: 160/100.</td>
</tr>
</tbody>
</table>

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

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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

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

**Participants** Volunteers from business settings with newly diagnosed hypertension (DBP 95mmHg, or DBP 91-94mmHg and SBP œ140mmHg)

**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 œ95mmHg; or <6mmHg in those with entry DBP 95mmHg or less.

**Allocation concealment**

B

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**Study** Martínez-Amenos 1990

**Methods** Parallel

**Participants**

Interventions used to improve control of blood pressure in patients with hypertension (Review)
### Characteristics of included studies (Continued)

<table>
<thead>
<tr>
<th>Study</th>
<th>Methods</th>
<th>Participants</th>
<th>Interventions</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>McAlister 1986</td>
<td>Cluster (60 doctors initially, 10 dropped out), parallel, Toronto Canada</td>
<td>N=50 general practitioners, 1241 (E) 990 (C), hypertensive patients with one of the following: (1) DBP &gt;90 mmHg on treatment (2) DBP &gt;104 mmHg not on treatment (3) DBP &gt;90 or &lt;105 mmHg unless evidence of complications or risk factors (4) Newly detected patients with “high blood pressure” detected during the trial</td>
<td>(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 &quot;stepped care” approach (2) Control group filled out same forms but no feedback given</td>
<td>(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 &gt;104mmHg: 88.5mmHg (E) vs 93.3mmHg (C), net DBP change 0.8mmHg P &lt;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</td>
</tr>
<tr>
<td>Mehos 2000</td>
<td>Parallel, individuals in a single family medicine clinic, US</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Characteristics of included studies (Continued)

<table>
<thead>
<tr>
<th>Participants</th>
<th>41 uncontrolled hypertensives, SBP 140-179mmHg and/or DBP 90-109mmHg, currently on treatment, mean age 59 years, 70% women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interventions</td>
<td>(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</td>
</tr>
<tr>
<td>Outcomes</td>
<td>(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</td>
</tr>
<tr>
<td>Notes</td>
<td>Duration of FU 6 months</td>
</tr>
</tbody>
</table>

#### 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 |
| Notes | Untreated subjects with 18% of (E) and 17% of (C) patients taking antihypertensive medication at the end of the RCT |

#### 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 cardiovascular 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 |
| Notes | Duration of FU 1 year |

#### 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-infocing 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) 60% 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

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

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

<table>
<thead>
<tr>
<th>Study</th>
<th>Park 1996</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Methods</strong></td>
<td>Parallel, individuals two pharmacies, US</td>
</tr>
<tr>
<td><strong>Participants</strong></td>
<td>Taking BP lowering treatment or had BP 140/90 mmHg, mainly white treated hypertensives, 50% women, mean age 60 years</td>
</tr>
</tbody>
</table>
| **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 |
| **Notes** | Duration of FU 4 months |

#### Allocation concealment  B

<table>
<thead>
<tr>
<th>Study</th>
<th>Pierce 1984</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Methods</strong></td>
<td>Factorial, individuals, single general practice clinic, Western Australia</td>
</tr>
<tr>
<td><strong>Participants</strong></td>
<td>Uncontrolled hypertensives (SBP 160 and/or DBP 95) taking BP medication, mean age 57 years, 60% women,</td>
</tr>
</tbody>
</table>
| **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 |
| **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

<table>
<thead>
<tr>
<th>Study</th>
<th>Robson 1989</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Methods</strong></td>
<td>Parallel, individuals based in a single family practice in UK</td>
</tr>
<tr>
<td><strong>Participants</strong></td>
<td>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</td>
</tr>
<tr>
<td><strong>Interventions</strong></td>
<td>(1) Recording and follow up of blood pressure and other cardiovascular risk factors with practice nurse or general practitioner aided by computer</td>
</tr>
</tbody>
</table>
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
**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

<table>
<thead>
<tr>
<th>Outcomes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Mean change in arterial blood pressure - improved -2.8 mmHg (E) versus +1.3 (C) p=0.013</td>
<td></td>
</tr>
<tr>
<td>(2) Mean change in systolic blood pressure - improved -4.9 mmHg (E) versus -0.1 (C) p=0.047</td>
<td></td>
</tr>
<tr>
<td>(3) Mean change in diastolic blood pressure - improved -2 mmHg (E) versus +2.1 (C) p=0.012</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Study</th>
<th>Rudd 2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methods</td>
<td>Parallel RCT, two medical clinics</td>
</tr>
<tr>
<td>Participants</td>
<td>Hypertension- SBP ≥140 mmHg or DBP ≥90 mmHg in previous six months or history of drug treatment. Drug therapy for patients with 150 mmHg or DBP 95 mmHg.</td>
</tr>
<tr>
<td>Interventions</td>
<td>(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 &lt;80% measurements met criterion of 130/85 mmHg.</td>
</tr>
</tbody>
</table>

(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 medication- 80.5% (E) versus 69.2% (C)

Duration of FU 6 months

Allocation concealment B

<table>
<thead>
<tr>
<th>Study</th>
<th>Sackett 1975</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methods</td>
<td>Factorial RCT</td>
</tr>
<tr>
<td>Steel mill employees in Canada</td>
<td></td>
</tr>
<tr>
<td>Participants</td>
<td>Hypertension 95 mmHg on repeated measurement. Not currently treated. n=230.</td>
</tr>
<tr>
<td>Interventions</td>
<td>(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 &quot;patient educator&quot;</td>
</tr>
</tbody>
</table>

(3) Both intervention

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

<table>
<thead>
<tr>
<th>Duration of FU 1 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notes Costs lower in (E) group (29%) with a non significant trend in reduction of SBP/DBP.</td>
</tr>
<tr>
<td>Allocation concealment</td>
</tr>
</tbody>
</table>

#### 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

<table>
<thead>
<tr>
<th>Duration of FU 6 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notes Losses to follow up not reported</td>
</tr>
<tr>
<td>Allocation concealment</td>
</tr>
</tbody>
</table>

#### 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)

<table>
<thead>
<tr>
<th>Duration of FU 1 and 2 years</th>
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<tbody>
<tr>
<td>Notes</td>
</tr>
<tr>
<td>Allocation concealment</td>
</tr>
</tbody>
</table>

#### 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

<table>
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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

Interventions used to improve control of blood pressure in patients with hypertension (Review)
### Characteristics of included studies (Continued)

#### Outcomes

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)
3. 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)

<table>
<thead>
<tr>
<th>Study (Year)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bond 1984</td>
<td>Non-randomised trial of clinical pharmacologist nurse clinician improving drug documentation, for blood pressure control and rheumatology/renal screening. Excluded: no BP outcome data.</td>
</tr>
<tr>
<td>Broege 2001</td>
<td>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.</td>
</tr>
<tr>
<td>Cappuccio 2004</td>
<td>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-</td>
</tr>
<tr>
<td>Caro 1998</td>
<td>Non-randomised trial. Observational study of compliance and persistence with therapy, excluded for these reasons.</td>
</tr>
<tr>
<td>Celis 1998</td>
<td>A randomised controlled trial protocol comparing self measurement of blood pressure against conventional blood pressure measurement. Protocol of trial. Excluded: no results reported.</td>
</tr>
<tr>
<td>Charlesworth 1984</td>
<td>Quasi randomised trial. Patients assigned random numbers and then ranked 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.</td>
</tr>
<tr>
<td>Consoli</td>
<td>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.</td>
</tr>
<tr>
<td>Consoli SM, Ben2</td>
<td>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.</td>
</tr>
<tr>
<td>Consoli SM, Ben3</td>
<td>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.</td>
</tr>
<tr>
<td>Cranney 1999</td>
<td>Non-randomised trial 9 pairs of practices matched by means of overall blood pressure control and then randomised to educational 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.</td>
</tr>
<tr>
<td>Denver 2003</td>
<td>120 Type 2 diabetic patients with uncontrolled hypertension (BP &gt;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.</td>
</tr>
<tr>
<td>Djerassi 1990</td>
<td>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.</td>
</tr>
<tr>
<td>Dusing 1998</td>
<td>Observational study of 1603 patients in 320 private practices in Germany. Investigated change in antihypertensive therapy 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%.</td>
</tr>
<tr>
<td>Erickson 1997</td>
<td>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.</td>
</tr>
</tbody>
</table>
### Characteristics of excluded studies (Continued)

<table>
<thead>
<tr>
<th>Study</th>
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</thead>
<tbody>
<tr>
<td>Flack 1995</td>
<td>Observational study reporting adherence rates with different classes of anti-hypertensive agents.</td>
</tr>
<tr>
<td>Flack 2000</td>
<td>Randomised trial of slow versus fast titration of blood pressure lowering drugs.</td>
</tr>
<tr>
<td>Foote 1983</td>
<td>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.</td>
</tr>
<tr>
<td>Girvin 1999</td>
<td>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.</td>
</tr>
<tr>
<td>Godley 2003</td>
<td>Evaluation of a quality improvement programme for 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.</td>
</tr>
<tr>
<td>Gonzalez-Fernandez</td>
<td>Parallel, individuals, hospitalised for &quot;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: &quot;knowing high BP&quot; by a physician; &quot;diet and high BP&quot; by a dietician; &quot;exercise and high BP&quot; by a health educator; &quot;medications and compliance in high BP&quot; 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</td>
</tr>
<tr>
<td>Grimm</td>
<td>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.</td>
</tr>
<tr>
<td>Hatcher 1986</td>
<td>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.</td>
</tr>
<tr>
<td>Herbert 2004</td>
<td>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.</td>
</tr>
<tr>
<td>Hyman</td>
<td>Questionnaire study self reported physician practice excluded for that reason.</td>
</tr>
<tr>
<td>Inui 1976</td>
<td>Before/after study intervention with tutor physician educating patients regarding their hypertension. Excluded: not a randomised trial.</td>
</tr>
<tr>
<td>Iso 1996</td>
<td>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.</td>
</tr>
<tr>
<td>Iso H,</td>
<td>Randomised trial of health education classes to patients. Excluded as intervention was non-pharmacological advice.</td>
</tr>
<tr>
<td>Krishan 1979</td>
<td>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.</td>
</tr>
<tr>
<td>Lewis 1967</td>
<td>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.</td>
</tr>
<tr>
<td>Linjer 1997</td>
<td>Non-randomised trial. Discussion paper regarding percentage of patients eligible in randomised trials generally at low risk in trial participants.</td>
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</table>
### Characteristics of excluded studies (Continued)

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<tbody>
<tr>
<td>Littenberg 1990</td>
<td>Non-randomised trial. Cost effectiveness study of increased blood pressure.</td>
</tr>
<tr>
<td>Marquez 2000</td>
<td>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</td>
</tr>
<tr>
<td>Mashru 1997</td>
<td>Before after study of interpractice audit following educational programme concerning diagnosis and management of hypertension. Six general practices in NW London, UK, 750 hypertensive patients. At two years follow up, two thirds of patients remained &quot;uncontrolled&quot; (BP&lt;160/90).</td>
</tr>
<tr>
<td>McDowell 1989</td>
<td>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 &quot;modest&quot;</td>
</tr>
<tr>
<td>McIntness 1995</td>
<td>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.</td>
</tr>
<tr>
<td>McKenney 1973</td>
<td>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</td>
</tr>
<tr>
<td>Murray 1988</td>
<td>Not hypertensive patients. Population: persons &quot;at risk&quot; 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</td>
</tr>
<tr>
<td>Pheley 1995</td>
<td>Observational study of nurse based hypertension clinic with no comparison group.</td>
</tr>
<tr>
<td>Putnam 1989</td>
<td>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 managemant. No difference in control of blood pressure in these family physician's patients at 18 months follow up. Reason for exclusion: non randomised trial</td>
</tr>
<tr>
<td>Staessen 2004</td>
<td>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 &quot;as guides to initiate and titrate antihypertensive drug treatment&quot;. (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.</td>
</tr>
<tr>
<td>Stahl 1984</td>
<td>Non-randomised trial. Self and family read blood pressure monitoring groups plus nurse education. Excluded because of non-randomised study.</td>
</tr>
<tr>
<td>Statson 1977</td>
<td>Non-randomised trial. Examining the cost effectiveness of treatment of hypertension</td>
</tr>
<tr>
<td>Stephenson 1999</td>
<td>Non-randomised trial.</td>
</tr>
<tr>
<td>Trocha 1999</td>
<td>91 hypertensive type 1 diabetic patients with overt diabetic nephropathy followed for 10 years. Intensified versus routine antihypertensive treatment. Blood pressure control and survival improved in the intensified group. Reason for exclusion: non randomised study</td>
</tr>
</tbody>
</table>
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.

Waebner 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. Outcome: improved surveillance and control of blood pressure in computer group.

Characteristics of ongoing studies

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

<table>
<thead>
<tr>
<th>Study</th>
<th>Krieger</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trial name or title</td>
<td>SHIP Clinic-Based Program</td>
</tr>
</tbody>
</table>
| 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 | pwhincup@sghms.ac.uk |
| Notes | RCT complete, anticipated publication in 2003 |

<table>
<thead>
<tr>
<th>Study</th>
<th>McManus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trial name or title</td>
<td>A randomised controlled trial of patient held targets and self monitoring in the control of hypertension: Targets And Self Monitoring IN Hypertension (TASMINH)</td>
</tr>
<tr>
<td>Participants</td>
<td>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</td>
</tr>
<tr>
<td>Interventions</td>
<td>All patients receive information on non pharmacological methods (British Hypertension Society self help leaflet). Intervention 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)</td>
</tr>
<tr>
<td>Outcomes</td>
<td>1. Blood pressure reading at 12 months follow up</td>
</tr>
<tr>
<td>Starting date</td>
<td>September 2001, last patient randomised March 2002, final follow up March 2003</td>
</tr>
</tbody>
</table>
| Contact information | Dr Richard McManus r.j.mcmanus@bham.ac.uk  
0121 414 2658 |
| Notes | RCT nearly complete, anticipate publication late 2003/early 2004 |

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

---

Interventions used to improve control of blood pressure in patients with hypertension (Review)  
Copyright © 2006 The Cochrane Collaboration. Published by John Wiley & Sons, Ltd
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

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>1. Blood pressure measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Mean systolic and diastolic blood pressure</td>
</tr>
<tr>
<td></td>
<td>3. Blood pressure control</td>
</tr>
</tbody>
</table>

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


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

<table>
<thead>
<tr>
<th>Study ID</th>
<th>Randomization</th>
<th>Allocation concealed</th>
<th>Blinding</th>
<th>Losses to follow up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carnahan</td>
<td>Method not stated</td>
<td>Not stated</td>
<td>No</td>
<td>1/50 (E- 2%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2/50 (C- 4%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1/50 (E- 2%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2/50 (C- 4%)</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td>1/50 (E- 2%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2/50 (C- 4%)</td>
</tr>
<tr>
<td>Hawkins</td>
<td>Method not stated</td>
<td>Not stated</td>
<td>No</td>
<td>225/574 (E- 39.2%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>294/574 (C-51.2%)</td>
</tr>
<tr>
<td>Evans</td>
<td>Method not stated</td>
<td>Not stated</td>
<td>Yes- BP check Staff &quot;blind&quot; to allocation group</td>
<td>5/107 (E- 5%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10/91 (C- 11%)</td>
</tr>
<tr>
<td>Hypertension Detection and Follow up (HDFP)</td>
<td>Randomisation done centrally, stratified by centre (n=14) and entry DBP strata (n=3)</td>
<td>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</td>
<td>No- neither participant or clinic blind to randomisation. BP outcome not blinded</td>
<td>967/5485 (E- 17.6%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>938/5422 (C-17.2%)</td>
</tr>
</tbody>
</table>

status of antihypertensive drug treatment not known at 1 year (includes lost to FU/dead/missing data)
<table>
<thead>
<tr>
<th>Study ID</th>
<th>Randomization</th>
<th>Allocation concealed</th>
<th>Blinding</th>
<th>Losses to follow up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jewell</td>
<td>Method not stated</td>
<td>Not stated</td>
<td>No</td>
<td>15/17 (E-12) 19/19 (C-0%)</td>
</tr>
<tr>
<td>Cummings</td>
<td>&quot;Randomisation list&quot;</td>
<td>Not stated</td>
<td>Yes</td>
<td>446/486 (E-8%) 420/487 (C-14%)</td>
</tr>
<tr>
<td>Tanner</td>
<td>&quot;Randomly assigned through a table of random numbers&quot;</td>
<td>Not stated</td>
<td>No</td>
<td>15/15 (E-0%) 15/15 (C-0%)</td>
</tr>
<tr>
<td>Zismer</td>
<td>Not stated</td>
<td>Not stated</td>
<td>No</td>
<td>26/26 (E-0%) 13/13 (C-0%)</td>
</tr>
<tr>
<td>Watkins</td>
<td>Not stated but stratified by age, sex, practice and last recorded BP</td>
<td>Not stated</td>
<td>Yes</td>
<td>414/565 (Overall-27%)</td>
</tr>
<tr>
<td>Rogers</td>
<td>Randomisation stratified by # prescription medications</td>
<td>Yes to physicians and clinical research staff but once completed &quot;open&quot;</td>
<td>No</td>
<td>56/60 (E-7%) 55/61 (C-10%)</td>
</tr>
<tr>
<td>Muhlhauser</td>
<td>Randomisation process for 10 participating practices. 20 patients per practice selected by means of random number chart</td>
<td>Not stated</td>
<td>No</td>
<td>86/100 (E-14%) 74/100 (C-26%)</td>
</tr>
<tr>
<td>Montgomery</td>
<td>Randomisation by means of random number table by a researcher not involved in study. Practices stratified by computer system used (2 alternative computer systems)</td>
<td>Yes</td>
<td>No</td>
<td>202/229 (E 1 12%) 199/228 (E 2-13%) 130/157 (C-17%)</td>
</tr>
<tr>
<td>Takala</td>
<td>Method not stated</td>
<td>Not stated</td>
<td>No</td>
<td>25/100 (E-25%) 32/102 (C-31%)</td>
</tr>
<tr>
<td>Sackett</td>
<td>Method not stated</td>
<td>Not stated</td>
<td>Yes</td>
<td>Factorial RCT</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(1) Convenience Augmented 6/114 (E-5%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Normal 4/116 (C-3%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(2) Mastery learning Yes 8/115 (E-7) No 2/115 (C-2%)</td>
</tr>
<tr>
<td>Haynes</td>
<td>Minimisation, method not stated, patients stratified according to important prognostic factors in previous RCT</td>
<td>Not stated</td>
<td>Yes</td>
<td>0/20 (E-0%) 1/19 (C-5%)</td>
</tr>
</tbody>
</table>
### Table 01. Quality of included randomized trials  
*(Continued)*

<table>
<thead>
<tr>
<th>Study ID</th>
<th>Randomization</th>
<th>Allocation concealed</th>
<th>Blinding</th>
<th>Losses to follow up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logan</td>
<td>Method not stated</td>
<td>Not stated</td>
<td>Yes</td>
<td>26/232 (E- 11%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>21/204 (C- 9%)</td>
</tr>
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<td></td>
<td>Factorial RCT</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(1) Self recording of blood pressure</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(E- 34/36- 6%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(2) Home visits</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td>(C-34/36- 6%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Free care versus 3 forms of cost-sharing plans.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Blood pressure outcome: Free care (E- 134/294, 46%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Cost share (C-</td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
<td>Johnson</td>
<td>Method not stated</td>
<td>Not stated</td>
<td>Yes</td>
<td>21/204 (C- 9%)</td>
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<tr>
<td></td>
<td>By means of &quot;random sampling techniques that made the distribution of family characteristics in each as similar as possible”</td>
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<tr>
<td></td>
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</tr>
<tr>
<td>Brook</td>
<td>By means of &quot;random sampling techniques that made the distribution of family characteristics in each as similar as possible”</td>
<td>Not stated</td>
<td>No</td>
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<tr>
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<td></td>
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<tr>
<td>Earp</td>
<td>Method not stated</td>
<td>Not stated</td>
<td>No</td>
<td>3 arm RCT</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Follow up at year 1 and 2</td>
</tr>
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<td></td>
<td>Group 1-</td>
</tr>
<tr>
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<td></td>
<td></td>
<td>1 year- 74/99, 25%</td>
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<td></td>
<td></td>
<td>2 year- 55/99, 44%</td>
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<td></td>
<td>Group 2-</td>
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<td></td>
<td></td>
<td>1 year- 41/56, 27%</td>
</tr>
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<td></td>
<td></td>
<td>2 year- 39%</td>
</tr>
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<td></td>
<td>Group 3(control)-</td>
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<tr>
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<td>1 year- 47/63, 25%</td>
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<td></td>
<td></td>
<td>2 year- 38/63, 40%</td>
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<tr>
<td>Martinez-Amenos</td>
<td>Method not stated</td>
<td>Not stated</td>
<td>No</td>
<td>No details on losses to FU provided</td>
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<tr>
<td>McAllister</td>
<td>Practice cluster stratified by:</td>
<td>Not stated</td>
<td>No</td>
<td>5/30 (E- 17%)</td>
</tr>
<tr>
<td></td>
<td>1) partners</td>
<td></td>
<td></td>
<td>5/30 (C- 17%)</td>
</tr>
<tr>
<td></td>
<td>2) Ethnicity randomisation by &quot;shuffled deck of cards”</td>
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<tr>
<td>Bogden</td>
<td>Randomisation by last digit of social security number:</td>
<td>Not stated</td>
<td>Yes</td>
<td>1/50 (E- 2%)</td>
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<tr>
<td></td>
<td>Odd # (E)</td>
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<td>4/50 (C- 8%)</td>
</tr>
<tr>
<td>Fielding</td>
<td>Randomisation by means of random numbers table</td>
<td>Not stated</td>
<td>No</td>
<td>6/80 (E- 7%)</td>
</tr>
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<td>8/79 (C- 10%)</td>
</tr>
<tr>
<td>Morisky and Levine</td>
<td>Randomisation through &quot;simple random&quot;</td>
<td>Not stated</td>
<td>No</td>
<td>Overall 64/400 (16%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Control of BP</td>
</tr>
<tr>
<td>Study ID</td>
<td>Randomization</td>
<td>Allocation concealed</td>
<td>Blinding</td>
<td>Losses to follow up</td>
</tr>
<tr>
<td>----------</td>
<td>---------------</td>
<td>----------------------</td>
<td>----------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Zarnke</td>
<td>Randomisation by means of computer generated list in blocks of six. Asymmetric allocation scheme (2:1 E:C)</td>
<td>Not stated</td>
<td>No</td>
<td>0/20 (E- 0%) 1/11 (C- 9%)</td>
</tr>
<tr>
<td>Roca-Cusachs</td>
<td>Research nurse &quot;allocated every patient to one of the two groups using a random scale balanced for age and BP&quot;</td>
<td>No</td>
<td>Yes</td>
<td>54/138 (E- 39%) 38/149 (C- 26%)</td>
</tr>
<tr>
<td>Soghikian</td>
<td>Method not stated</td>
<td>Not stated</td>
<td>No</td>
<td>15/215 (E- 7%) 25/215 (C- 12%)</td>
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<td>Billault</td>
<td>Method not stated</td>
<td>Not stated</td>
<td>No</td>
<td>82/101 (E- 19%) 85/99 (C- 14%)</td>
</tr>
<tr>
<td>Gullion</td>
<td>Method not stated, physicians stratified according to four criteria: (1) % patients whose DBP controlled. (2) % patients responding to the survey (3) Physician's ethnic group (4) Specialty</td>
<td>Not stated</td>
<td>Yes</td>
<td>(1) Medical- 27 (2) Behavioural- 28 (3) Both- 30 (4) Neither- 27</td>
</tr>
<tr>
<td>Friedman</td>
<td>Randomized &quot;using a paired randomisation protocol&quot;</td>
<td>Not stated</td>
<td>Yes</td>
<td>23/133 (E- 17%) 11/134 (C- 8%)</td>
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<tr>
<td>Hetlevik</td>
<td>Method not stated</td>
<td>Not stated</td>
<td>No</td>
<td>816/984 (E- 17.1%) 1255 (C- 18.5%)</td>
</tr>
<tr>
<td>Krieger</td>
<td>Randomisation based on computer-generated random number table Sealed opaque envelopes, sequentially numbered. Not clear who allocated individuals to groups</td>
<td>Sealed opaque envelopes, sequentially numbered. Not clear who allocated individuals to groups</td>
<td>No</td>
<td>146/209 (E- 30.1%) 165/212 (C- 22.2%)</td>
</tr>
<tr>
<td>Dickinson</td>
<td>Method not stated</td>
<td>Not stated</td>
<td>No</td>
<td>51/51 (E feedback- 0%)</td>
</tr>
</tbody>
</table>
Table 01. Quality of included randomized trials  

<table>
<thead>
<tr>
<th>Study ID</th>
<th>Randomization</th>
<th>Allocation concealed</th>
<th>Blinding</th>
<th>Losses to follow up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barnett</td>
<td>Method not stated but stratified by age and initial DBP (100mmHg or &lt;100mmHg)</td>
<td>Not stated</td>
<td>No</td>
<td>78/78 (E education-0%)</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>88/88 (E both-0%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>33/33 (C neither-0%)</td>
</tr>
<tr>
<td>Bulpitt</td>
<td>Method not stated</td>
<td>Not stated</td>
<td>No</td>
<td>44/63 (E-30%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>27/52 (C-48%)</td>
</tr>
<tr>
<td>Coe</td>
<td>Method not stated</td>
<td>Not stated</td>
<td>Yes</td>
<td>56/56 (E-0%)</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>60/60 (C-0%)</td>
</tr>
<tr>
<td>Robson</td>
<td>Random number tables</td>
<td>Not stated</td>
<td>No</td>
<td>7/1620 (E-7%)</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>7/1586 (C-7%)</td>
</tr>
<tr>
<td>Bloom</td>
<td>Method not stated</td>
<td>Not stated</td>
<td>Yes</td>
<td>12/27 (E-44%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>19/27 (C-74%)</td>
</tr>
<tr>
<td>Fletcher</td>
<td>Patients were &quot;divided by means of a table of random numbers&quot;</td>
<td>Not stated</td>
<td>Uncertain</td>
<td>144/155 (93%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>followed up at five months. Group losses to FU not reported</td>
</tr>
<tr>
<td>Bailey</td>
<td>Method not stated</td>
<td>Not stated</td>
<td>Yes</td>
<td>29/30 (E-3%)</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td>31/32 (C-3%)</td>
</tr>
<tr>
<td>Webb</td>
<td>Method not stated</td>
<td>Not stated</td>
<td>Yes</td>
<td>37/37 (E1-0%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>31/31 (E2-0%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>55/55 (C-0%)</td>
</tr>
<tr>
<td>Hamilton</td>
<td>Method not stated</td>
<td>Not stated</td>
<td>No</td>
<td>7/17 (E-0%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4/17 (C-24%)</td>
</tr>
<tr>
<td>Park</td>
<td>Method not stated</td>
<td>Not stated</td>
<td>No</td>
<td>5/32 (E-16%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6/32 (C-19%)</td>
</tr>
<tr>
<td>Mehos</td>
<td>Yes &quot;randomized using a deck of cards&quot;</td>
<td>Not stated</td>
<td>No</td>
<td>2/20 (E-10%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3/21 (C-14%)</td>
</tr>
<tr>
<td>Pierce</td>
<td>Yes &quot;minimisation&quot;</td>
<td>Not stated</td>
<td>Yes</td>
<td>59/59 (E health education-0%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>54/57 (E monitor-8.5%)</td>
</tr>
<tr>
<td>Solomon</td>
<td>Yes, random number tables</td>
<td>Not stated</td>
<td>No</td>
<td>63/63 (E-0%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>70/70 (C-0%)</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>63/63 (E-0%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>70/70 (C-0%)</td>
</tr>
<tr>
<td>Burelle</td>
<td>Not stated</td>
<td>Not stated</td>
<td>No</td>
<td>8/8 (E-0%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8/8 (C-0%)</td>
</tr>
<tr>
<td>Ahluwalia</td>
<td>Yes, computer generated random number table</td>
<td>Not stated</td>
<td>No</td>
<td>8/8 (E-0%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8/8 (C-0%)</td>
</tr>
</tbody>
</table>
### Table 01. Quality of included randomized trials  (Continued)

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

### ANALYSES

Comparison 01. Active intervention versus control

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

<table>
<thead>
<tr>
<th>Study</th>
<th>Treatment</th>
<th>Control</th>
<th>Weighted Mean Difference (Fixed)</th>
<th>Weight (%)</th>
<th>Weighted Mean Difference (Fixed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Artinian 2001</td>
<td>6</td>
<td>-25.00 (13.80)</td>
<td>9 1.00 (14.10)</td>
<td>0.9</td>
<td>-26.00 [-40.38, -11.62]</td>
</tr>
<tr>
<td>Bailey 1998</td>
<td>31</td>
<td>-8.00 (19.40)</td>
<td>29 -13.00 (19.00)</td>
<td>2.0</td>
<td>5.00 [-4.72, 14.72]</td>
</tr>
<tr>
<td>Carnahan 1975</td>
<td>49</td>
<td>-18.00 (18.50)</td>
<td>48 -10.50 (14.90)</td>
<td>4.2</td>
<td>-7.50 [-14.18, -0.82]</td>
</tr>
<tr>
<td>Friedman 1996</td>
<td>110</td>
<td>-11.00 (13.40)</td>
<td>123 -10.60 (13.70)</td>
<td>15.4</td>
<td>-0.40 [-3.88, 3.08]</td>
</tr>
<tr>
<td>Mehos 2000</td>
<td>18</td>
<td>-17.10 (15.80)</td>
<td>18 -5.00 (17.30)</td>
<td>2.0</td>
<td>-10.10 [-19.82, -0.38]</td>
</tr>
<tr>
<td>Midanik 1991</td>
<td>74</td>
<td>-1.00 (15.80)</td>
<td>72 1.00 (17.30)</td>
<td>6.5</td>
<td>-2.00 [-7.38, 3.38]</td>
</tr>
<tr>
<td>Rogers 2001</td>
<td>56</td>
<td>-4.90 (13.50)</td>
<td>55 -0.10 (13.40)</td>
<td>7.5</td>
<td>-4.80 [-9.80, 0.20]</td>
</tr>
<tr>
<td>Rudd 2004</td>
<td>74</td>
<td>-14.20 (17.80)</td>
<td>76 -5.70 (18.40)</td>
<td>5.6</td>
<td>-8.50 [-14.29, -2.71]</td>
</tr>
<tr>
<td>Soghikian 1992</td>
<td>200</td>
<td>-1.50 (13.90)</td>
<td>190 1.80 (17.00)</td>
<td>19.6</td>
<td>3.30 [-6.39, -0.21]</td>
</tr>
<tr>
<td>Vetter 2000</td>
<td>296</td>
<td>-21.00 (14.50)</td>
<td>326 -20.50 (14.30)</td>
<td>36.4</td>
<td>-0.50 [-2.77, 1.77]</td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td>914</td>
<td>946</td>
<td>-10.0 (946)</td>
<td>100.0</td>
<td>-2.50 [-3.87, -1.13]</td>
</tr>
</tbody>
</table>

Test for heterogeneity chi-square=26.66 df=9 p=0.002 I² =66.2%
Test for overall effect z=3.59 p=0.0003
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)

<table>
<thead>
<tr>
<th>Study</th>
<th>Treatment</th>
<th>Control</th>
<th>Weighted Mean Difference (Fixed)</th>
<th>Weight</th>
<th>Weighted Mean Difference (Fixed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Artinian 2001</td>
<td>6</td>
<td>-14.00 (8.70)</td>
<td>9</td>
<td>-2.00 (9.90)</td>
<td>0.5</td>
</tr>
<tr>
<td>Bailey 1998</td>
<td>31</td>
<td>-6.00 (2.80)</td>
<td>29</td>
<td>-4.00 (2.80)</td>
<td>21.2</td>
</tr>
<tr>
<td>Carnahan 1975</td>
<td>49</td>
<td>-10.40 (9.80)</td>
<td>48</td>
<td>-10.40 (9.80)</td>
<td>2.8</td>
</tr>
<tr>
<td>Friedman 1996</td>
<td>110</td>
<td>-5.20 (8.30)</td>
<td>123</td>
<td>-0.80 (8.00)</td>
<td>9.7</td>
</tr>
<tr>
<td>Haynes 1976</td>
<td>20</td>
<td>-5.40 (5.70)</td>
<td>18</td>
<td>-1.90 (5.40)</td>
<td>3.4</td>
</tr>
<tr>
<td>Johnson 1978</td>
<td>34</td>
<td>-8.50 (8.10)</td>
<td>34</td>
<td>-7.50 (11.30)</td>
<td>2.0</td>
</tr>
<tr>
<td>Mehos 2000</td>
<td>18</td>
<td>-10.50 (10.40)</td>
<td>18</td>
<td>-3.80 (9.30)</td>
<td>1.0</td>
</tr>
<tr>
<td>Midanik 1991</td>
<td>74</td>
<td>1.00 (9.40)</td>
<td>72</td>
<td>1.00 (8.40)</td>
<td>5.1</td>
</tr>
<tr>
<td>Rogers 2001</td>
<td>56</td>
<td>-1.90 (10.00)</td>
<td>55</td>
<td>2.10 (10.00)</td>
<td>3.1</td>
</tr>
<tr>
<td>Rudd 2004</td>
<td>74</td>
<td>-6.50 (9.90)</td>
<td>76</td>
<td>-3.40 (7.80)</td>
<td>5.2</td>
</tr>
<tr>
<td>Soghikian 1992</td>
<td>200</td>
<td>0.10 (9.10)</td>
<td>190</td>
<td>1.70 (10.20)</td>
<td>11.5</td>
</tr>
<tr>
<td>Vetter 2000</td>
<td>296</td>
<td>-13.20 (7.20)</td>
<td>326</td>
<td>-11.90 (6.90)</td>
<td>34.5</td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td>968</td>
<td>998</td>
<td>100.0</td>
<td>-2.03 [-2.69, -1.38]</td>
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</tr>
</tbody>
</table>

Test for heterogeneity chi-square=18.40 df=11 p=0.07 I²=40.2%
Test for overall effect z=6.10  p<0.00001
### 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)

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

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

Test for heterogeneity chi-square=2.30 df=3 p=0.51 I² =0.0%

Test for overall effect z=0.96  p=0.3

---

### 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)

<table>
<thead>
<tr>
<th>Study</th>
<th>Treatment N</th>
<th>Control N</th>
<th>Weighted Mean Difference (Fixed)</th>
<th>Weight (%)</th>
<th>Weighted Mean Difference (Fixed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Billault 1995</td>
<td>82 (Mean(SD)) = -2.70 (16.50)</td>
<td>85 (Mean(SD)) = -1.60 (14.60)</td>
<td>18.0</td>
<td>-1.10 [-5.83, 3.63]</td>
<td></td>
</tr>
<tr>
<td>Burrelle 1986</td>
<td>8 (Mean(SD)) = -13.20 (16.00)</td>
<td>8 (Mean(SD)) = -5.80 (14.80)</td>
<td>1.8</td>
<td>7.40 [-22.50, 7.70]</td>
<td></td>
</tr>
<tr>
<td>Fielding 1994</td>
<td>74 (Mean(SD)) = -10.90 (19.30)</td>
<td>71 (Mean(SD)) = -2.40 (19.50)</td>
<td>10.1</td>
<td>-8.50 [-14.82, -2.18]</td>
<td></td>
</tr>
<tr>
<td>Muhhauser 1993</td>
<td>86 (Mean(SD)) = -8.00 (13.50)</td>
<td>74 (Mean(SD)) = -3.00 (13.90)</td>
<td>22.2</td>
<td>5.00 [-9.26, 5.74]</td>
<td></td>
</tr>
<tr>
<td>Roca-Cusachs 1991</td>
<td>84 (Mean(SD)) = -16.70 (18.50)</td>
<td>111 (Mean(SD)) = -18.00 (21.60)</td>
<td>12.7</td>
<td>1.30 [-4.34, 6.94]</td>
<td></td>
</tr>
<tr>
<td>Watkins 1987</td>
<td>204 (Mean(SD)) = -0.20 (18.60)</td>
<td>210 (Mean(SD)) = -0.80 (18.60)</td>
<td>31.4</td>
<td>0.60 [-2.98, 4.18]</td>
<td></td>
</tr>
<tr>
<td>Zismer 1982</td>
<td>26 (Mean(SD)) = -13.10 (13.90)</td>
<td>13 (Mean(SD)) = 2.60 (16.20)</td>
<td>3.8</td>
<td>15.70 [-26.00, 5.40]</td>
<td></td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td>564 (Mean(SD)) = -4.70 (7.80)</td>
<td>572 (Mean(SD)) = 1.00 (7.80)</td>
<td>100.0</td>
<td>2.54 [-4.55, -0.53]</td>
<td></td>
</tr>
</tbody>
</table>

Test for heterogeneity chi-square=16.45 df=6 p=0.01 I² =63.5%

Test for overall effect z=2.48  p=0.01

---

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

<table>
<thead>
<tr>
<th>Study</th>
<th>Treatment</th>
<th>Control</th>
<th>Weighted Mean Difference (Fixed)</th>
<th>Weight (%)</th>
<th>Weighted Mean Difference (Fixed)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N Mean(SD)</td>
<td>N Mean(SD)</td>
<td>95% CI (%)</td>
<td></td>
<td>95% CI (%)</td>
</tr>
<tr>
<td>Billault 1995</td>
<td>82 1.30 (7.80)</td>
<td>85 -0.10 (11.20)</td>
<td>12.3 1.40 [ -1.52, 4.32 ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Burrelle 1986</td>
<td>8 -4.10 (11.90)</td>
<td>8 -1.12 (13.10)</td>
<td>0.7 7.10 [ -5.16, 19.36 ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fielding 1994</td>
<td>74 -5.60 (9.70)</td>
<td>71 -1.70 (9.80)</td>
<td>10.4 -3.90 [ -7.07, -0.73 ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Muhlhauser 1993</td>
<td>86 -5.00 (7.30)</td>
<td>74 -2.00 (8.20)</td>
<td>17.8 -3.00 [ -5.42, -0.58 ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roca-Cusachs 1991</td>
<td>84 -7.60 (9.50)</td>
<td>111 -9.50 (11.70)</td>
<td>11.8 1.90 [ -1.08, 4.88 ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tanner 1981</td>
<td>15 -3.70 (6.90)</td>
<td>15 -3.90 (6.90)</td>
<td>4.3 0.20 [ -4.74, 5.14 ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Watkins 1987</td>
<td>204 0.30 (9.30)</td>
<td>210 -0.10 (9.30)</td>
<td>32.6 0.40 [ -1.39, 2.19 ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Webb 1980</td>
<td>37 -6.80 (9.00)</td>
<td>55 -3.50 (8.40)</td>
<td>7.8 -3.30 [ -6.95, 0.35 ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zismer 1982</td>
<td>26 -8.20 (8.90)</td>
<td>13 0.50 (10.90)</td>
<td>2.2 -8.70 [ -15.54, -1.86 ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td>616 642</td>
<td></td>
<td>100.0 -0.81 [ -1.83, 0.21 ]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Test for heterogeneity chi-square=22.57 df=8 p=0.004 I² = 64.5%  
Test for overall effect z=1.55 p=0.1

### 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)

<table>
<thead>
<tr>
<th>Study</th>
<th>Treatment</th>
<th>Control</th>
<th>Odds Ratio (Fixed)</th>
<th>Weight (%)</th>
<th>Odds Ratio (Fixed)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n/N</td>
<td>n/N</td>
<td>95% CI (%)</td>
<td></td>
<td>95% CI (%)</td>
</tr>
<tr>
<td>Earp 1982</td>
<td>14/41</td>
<td>16/47</td>
<td>1.79 1.00 [ 0.42, 2.43 ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morisky 1983</td>
<td>15/44</td>
<td>24/40</td>
<td>3.02 0.34 [ 0.14, 0.84 ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Muhlhauser 1993</td>
<td>74/86</td>
<td>63/74</td>
<td>1.72 1.08 [ 0.44, 2.61 ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pierce 1984</td>
<td>10/59</td>
<td>9/27</td>
<td>1.87 0.41 [ 0.14, 1.17 ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sackett 1975</td>
<td>61/80</td>
<td>26/32</td>
<td>1.61 0.74 [ 0.27, 2.07 ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td>310</td>
<td>220</td>
<td>100.0 0.66 [ 0.44, 1.01 ]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total events: 174 (Treatment), 138 (Control)  
Test for heterogeneity chi-square=4.95 df=4 p=0.29 I² = 19.2%  
Test for overall effect z=1.93 p=0.05
### 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)

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

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

---

### 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)

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

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

---

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

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

Total events: 3343 (Treatment), 3071 (Control)
Test for heterogeneity chi-square=12.66 df=5 p=0.003 I²=60.5%
Test for overall effect z=4.53 p<0.0001

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)

<table>
<thead>
<tr>
<th>Study</th>
<th>Treatment</th>
<th>Control</th>
<th>Weighted Mean Difference (Fixed)</th>
<th>Weight</th>
<th>Weighted Mean Difference (Fixed)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean(SD)</td>
<td>95% CI (%)</td>
<td></td>
<td>95% CI</td>
</tr>
<tr>
<td>Bogden 1998</td>
<td>49</td>
<td>-23.00 (22.60)</td>
<td>-12.00 [-20.57, -3.43]</td>
<td>2.9</td>
<td></td>
</tr>
<tr>
<td>Garcia-Pena 2001</td>
<td>345</td>
<td>-6.80 (17.70)</td>
<td>-3.30 [-5.88, -0.72]</td>
<td>31.9</td>
<td></td>
</tr>
<tr>
<td>Hawkins 1979</td>
<td>349</td>
<td>-2.00 (14.10)</td>
<td>0.00 [-1.94, 1.94]</td>
<td>56.6</td>
<td></td>
</tr>
<tr>
<td>Park 1996</td>
<td>23</td>
<td>-12.30 (15.80)</td>
<td>-13.00 [-22.59, -3.41]</td>
<td>2.3</td>
<td></td>
</tr>
<tr>
<td>Solomon 2002</td>
<td>63</td>
<td>-8.20 (15.20)</td>
<td>-6.90 [-12.72, -1.08]</td>
<td>6.3</td>
<td></td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td>829</td>
<td>761</td>
<td>100.0</td>
<td>2.14</td>
<td>[-3.59, -0.68]</td>
</tr>
</tbody>
</table>

Test for heterogeneity chi-square=18.03 df=4 p=0.001 I²=77.8%
Test for overall effect z=2.87 p=0.004
### 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)

<table>
<thead>
<tr>
<th>Study</th>
<th>Treatment</th>
<th>Control</th>
<th>Weighted Mean Difference (Fixed)</th>
<th>Weight</th>
<th>Weighted Mean Difference (Fixed)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N Mean(SD)</td>
<td>N Mean(SD)</td>
<td>95% CI (%)</td>
<td></td>
<td>95% CI (%)</td>
</tr>
<tr>
<td>Bogden 1998</td>
<td>49 -11.00 (9.40)</td>
<td>46 -3.00 (10.20)</td>
<td>2.0 -8.00 [ -11.95, -4.05 ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Garcia-Pena 2001</td>
<td>345 -3.70 (9.20)</td>
<td>338 0.00 (9.60)</td>
<td>16.0 -3.70 [ -5.11, -2.29 ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hawkins 1979</td>
<td>349 -2.00 (5.30)</td>
<td>280 -2.00 (4.00)</td>
<td>60.2 0.00 [ -0.73, 0.73 ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Logan 1979</td>
<td>206 -10.00 (6.40)</td>
<td>204 -6.10 (7.20)</td>
<td>18.3 -3.90 [ -5.22, -2.58 ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Park 1996</td>
<td>23 -4.60 (8.50)</td>
<td>27 0.40 (9.30)</td>
<td>1.3 -5.00 [ -9.94, -0.06 ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solomon 2002</td>
<td>63 -4.40 (1.40)</td>
<td>70 -3.80 (1.100)</td>
<td>2.2 -0.60 [ -4.42, 3.22 ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td>1035 965</td>
<td></td>
<td>100.0 -1.55 [ -2.11, -0.98 ]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Test for heterogeneity chi-square=50.92 df=5 p<0.0001 I²=90.2%
Test for overall effect z=5.37 p<0.00001

---

### 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)

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

Total events: 360 (Treatment), 527 (Control)
Test for heterogeneity chi-square=17.34 df=4 p=0.002 I²=76.9%
Test for overall effect z=10.19 p<0.00001

---

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### 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)

<table>
<thead>
<tr>
<th>Study</th>
<th>Treatment</th>
<th>Control</th>
<th>Weighted Mean Difference (Fixed)</th>
<th>Weight (%)</th>
<th>Weighted Mean Difference (Fixed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulpitt 1976</td>
<td>80 -28.80 (17.60)</td>
<td>71 -28.40 (17.10)</td>
<td>2.3 -0.40 [ -5.94, 5.14 ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dickinson 1981</td>
<td>51 -12.00 (19.70)</td>
<td>33 -11.00 (23.80)</td>
<td>0.8 -1.00 [ -10.76, 8.76 ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypertension 1979</td>
<td>2872 -23.60 (16.20)</td>
<td>1718 -15.40 (17.50)</td>
<td>69.2 -8.20 [ -9.32, -7.18 ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypertension 1979a</td>
<td>811 -38.90 (17.50)</td>
<td>542 -27.20 (18.60)</td>
<td>18.4 -11.70 [ -13.68, -9.72 ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypertension 1982</td>
<td>438 -52.30 (21.90)</td>
<td>311 -41.70 (21.40)</td>
<td>7.3 -10.60 [ -13.74, -7.46 ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Takala 1979</td>
<td>39 -26.00 (18.40)</td>
<td>36 -29.00 (17.50)</td>
<td>1.1 3.00 [ -5.13, 11.13 ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Takala 1983</td>
<td>36 -35.00 (18.50)</td>
<td>34 -38.00 (18.00)</td>
<td>1.0 3.00 [ -5.55, 11.55 ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td>4327</td>
<td>2745</td>
<td>100.0 -8.55 [ -9.40, -7.70 ]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Test for heterogeneity chi-square=37.24 df=6 p=0.0001 I² =83.9%

Test for overall effect z=19.79 p=0.00001

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)

<table>
<thead>
<tr>
<th>Study</th>
<th>Treatment</th>
<th>Control</th>
<th>Weighted Mean Difference (Fixed)</th>
<th>Weight (%)</th>
<th>Weighted Mean Difference (Fixed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulpitt 1976</td>
<td>80 -9.20 (8.80)</td>
<td>71 -9.40 (8.50)</td>
<td>2.0 0.20 [ -2.56, 2.96 ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dickinson 1981</td>
<td>51 -6.00 (9.90)</td>
<td>33 -4.00 (14.70)</td>
<td>0.5 -2.00 [ -7.70, 3.70 ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypertension 1979</td>
<td>2872 -10.90 (7.30)</td>
<td>1718 -6.70 (8.10)</td>
<td>71.0 -4.20 [ -4.67, -3.73 ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypertension 1979a</td>
<td>811 -20.80 (7.20)</td>
<td>542 -14.30 (9.00)</td>
<td>18.9 -6.50 [ -7.41, -5.59 ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypertension 1982</td>
<td>438 -30.50 (9.80)</td>
<td>311 -22.90 (12.20)</td>
<td>5.8 -7.60 [ -9.24, -5.96 ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Takala 1979</td>
<td>39 -12.00 (9.20)</td>
<td>36 -15.00 (8.70)</td>
<td>0.9 3.00 [ -1.05, 7.05 ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Takala 1983</td>
<td>36 -11.00 (9.20)</td>
<td>34 -16.00 (9.00)</td>
<td>0.9 5.00 [ 0.74, 9.26 ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td>4327</td>
<td>2745</td>
<td>100.0 -4.58 [ -4.90, -4.19 ]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Test for heterogeneity chi-square=78.02 df=6 p=0.00001 I² =92.3%

Test for overall effect z=22.84 p=0.00001

Favours treatment Favours control

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

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

Total events: 2092 (Treatment), 3193 (Control)  
Test for heterogeneity chi-square=12.85 df=4 p=0.01 I²=68.9%  
Test for overall effect z=21.99 p<0.00001

### 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)

<table>
<thead>
<tr>
<th>Study</th>
<th>Treatment n/N</th>
<th>Control n/N</th>
<th>Odds Ratio (Fixed)</th>
<th>Weight (%)</th>
<th>Odds Ratio (Fixed) 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ahluwalia 1996</td>
<td>8/53</td>
<td>6/54</td>
<td></td>
<td>2.2</td>
<td>1.42 [0.46, 4.42]</td>
</tr>
<tr>
<td>Barnett 1983</td>
<td>1/63</td>
<td>28/52</td>
<td></td>
<td>13.0</td>
<td>0.01 [0.00, 1.11]</td>
</tr>
<tr>
<td>Bloom 1979</td>
<td>12/27</td>
<td>20/27</td>
<td></td>
<td>4.8</td>
<td>0.28 [0.09, 0.88]</td>
</tr>
<tr>
<td>Cummings 1985</td>
<td>70/486</td>
<td>129/487</td>
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<td>47.4</td>
<td>0.47 [0.34, 0.65]</td>
</tr>
<tr>
<td>Fletcher 1975</td>
<td>12/74</td>
<td>26/70</td>
<td></td>
<td>9.6</td>
<td>0.33 [0.15, 0.72]</td>
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<tr>
<td>Krieger 1999</td>
<td>51/146</td>
<td>88/165</td>
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<td>23.1</td>
<td>0.47 [0.30, 0.74]</td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td>849</td>
<td>855</td>
<td></td>
<td>100.0</td>
<td>0.41 [0.32, 0.51]</td>
</tr>
</tbody>
</table>

Total events: 154 (Treatment), 297 (Control)  
Test for heterogeneity chi-square=16.85 df=5 p=0.005 I²=70.4%  
Test for overall effect z=7.66 p<0.00001