Blood pressure control by home monitoring: meta-analysis of randomised trials

Cappuccio F P, Kerry S M, Forbes L, Donald A

CRD summary
This well-conducted review looked at the effect of people (with high blood pressure) monitoring their own blood pressure at home. The authors found that blood pressure was better controlled and the number of people reaching the target levels was increased. Although the difference was small, the authors considered it was likely to contribute to a reduction in vascular complications.

Authors' objectives
To determine the effect of blood-pressure (BP) monitoring at home on BP levels and the proportion of people with essential hypertension achieving target BP levels, compared with the usual monitoring of BP in the health care system.

Searching
MEDLINE (from 1966 to January 2003) and EMBASE (from 1980 to January 2003) were searched. Full details of the search strategy were available in an appendix to the paper, via the BMJ website. See Web Address at end of abstract. The Cochrane Database of Systematic Reviews, DARE, HTA, NHS EED, TRIP, and the websites of the Centre for Reviews and Dissemination and the Agency for Healthcare Research and Quality were also searched for reviews. The reference lists of relevant reviews and all identified studies were also checked. No language restrictions were applied.

Study selection
Study designs of evaluations included in the review
Only randomised controlled trials (RCTs) were eligible for inclusion.

Specific interventions included in the review
Studies that included at least one measurement of BP performed at home by study participants or their family members, whether the result was recorded by the participant or transmitted to a health care provider, were eligible for inclusion. Trials that used ‘ambulatory’ BP monitoring rather than ‘home’ or ‘self’ monitoring were excluded. The comparison group was BP control following measurement by health care professionals in clinical settings, usually referred to as usual or standard care, but also including nurse clinics, educational interventions and flagged medical records. Across the studies, the duration of the intervention ranged from 2 to 36 months.

Participants included in the review
Studies of people with high BP were eligible for inclusion. The studies were based in hospital out-patient clinics, communities, general practices and mixed settings.

Outcomes assessed in the review
To be included, the studies had to use BP as an outcome measure. Changes in BP (systolic, diastolic and mean) between intervention and control arms, and the change in the proportion of people with BP above the target levels, were calculated. The target BP was as defined in the included studies: some studies reported diastolic BP only (where target levels were set at 90 or 95 mmHg), while others considered a systolic pressure of 140 mmHg and a diastolic pressure of 90 mmHg as target levels.

How were decisions on the relevance of primary studies made?
Two reviewers independently examined the data. Differences about the inclusion of studies were resolved by arbitration.

Assessment of study quality
The authors did not state that they assessed validity. However, they did comment on blinding and concealment of
Data extraction
Two reviewers independently extracted the data from text, tables and graphs. Differences about the interpretation of data were resolved by arbitration. The mean (and standard deviation, SD) change in systolic BP, diastolic BP, or mean arterial pressure was extracted from each study. Where the SD of the change was not reported, or could not be calculated from the 95% confidence interval (CI), the authors estimated it as the average of the SDs of the initial and follow-up pressures, where only the SD of the change was missing. If no SDs were reported, then the average SD for all remaining studies was used. The relative risk was used to estimate the effect of the intervention on the proportion of patients with BP above the target levels at follow-up.

Methods of synthesis
How were the studies combined?
Random-effects models were used to pool the outcome measures. Publication bias was assessed using a funnel plot and Egger’s test (see Other Publications of Related Interest no.1). The trim and fill method (see Other Publications of Related Interest no.2) was used to investigate the asymmetry of the funnel plot.

How were differences between studies investigated?
The chi-squared test was used to investigate heterogeneity between the studies.

Results of the review
Eighteen RCTs (1,359 people in the intervention groups and 1,355 in the control groups) were included.

Systolic BP (13 studies).
The overall effect of the intervention on systolic BP was 4.2 mmHg (95% CI: 1.5, 6.9). There was significant heterogeneity between the studies (P<0.001). There was some evidence of publication bias. The trim and fill method of assessing publication bias estimated three missing studies and a revised estimate of 2.2 mmHg (95% CI: -0.9, 5.3).

Diastolic BP (16 studies).
The overall effect of the intervention on diastolic BP was 2.4 mmHg (95% CI: 1.2, 3.5). There was significant heterogeneity between the studies (P=0.014). There was some suggestion of publication bias. The trim and fill method of assessing publication bias estimated two missing studies and a revised estimate of 1.9 mmHg (95% CI: 0.6, 3.2).

Mean arterial pressure (3 studies).
The overall effect of the intervention on mean arterial pressure was 4.4 mmHg (95% CI: 2.0, 6.8), with no statistically significant evidence of heterogeneity (P=0.319).

BP control (6 studies).
The pooled relative risk for the proportion of patients whose BP was below the target levels at follow-up in the intervention group, compared with the control group, was 1.11 (95% CI: 1.0, 1.24). There was no statistically significant evidence of heterogeneity (P=0.34).

Authors’ conclusions
BP control in people with hypertension and the proportion of people achieving target levels are increased with the use of BP monitoring at home, rather than standard BP monitoring in the health care system. The reasons for this are unclear. The difference in BP control between the two methods was small, but is likely to contribute to an important reduction in vascular complications in the hypertensive population.
CRD commentary
Two versions of this paper were available: an abridged version published in the paper version of the BMJ and a longer version published on the BMJ website (see Web Address at end of abstract).

This was a well-conducted and clearly reported review. The review answered a clearly defined objective that was supported by explicit inclusion criteria. A detailed literature search, which was not limited by language, was conducted; it is unlikely that any important studies were missed. Some details of the review process were provided and, while the authors did not report a formal method for assessing validity, some methodological details were reported in the 'Results' section. Details of the studies were tabulated and their results were summarised using forest plots. The methods used to combine the studies were appropriate, heterogeneity was formally assessed, and publication bias was considered. However, no attempts were made to investigate reasons for the observed heterogeneity. The authors' conclusions are supported by the results presented, although a more cautious interpretation of the effect of home monitoring on systolic and diastolic BP should be put forward given the evidence of publication bias.

Implications of the review for practice and research
Practice: The authors stated that patients should be involved more closely in the management of their own BP and help to manage their hypertension more effectively.

Research: The authors stated that there is a need for further evidence from prospective studies of outcomes to inform potential modifications of treatment guidelines.

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Other publications of related interest

This additional published commentary may also be of interest. Gutknecht DR. Review: home or self blood pressure monitoring improves clinic blood pressure in essential hypertension. Evid Based Med 2005;10:40.

Indexing Status
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MeSH
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Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.