Impact of home blood pressure telemonitoring and blood pressure control: a meta-analysis of randomized controlled studies

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CRD summary
The review concluded that home blood pressure telemonitoring may represent a useful tool to improve blood pressure control but well-designed large-scale trials were needed to demonstrate its clinical usefulness. The uncertain quality of the evidence base and heterogeneity across studies mean that caution is warranted when interpreting the authors’ conclusions and recommendations.

Authors' objectives
To summarise the evidence from randomised controlled trials of the effectiveness of home blood pressure telemonitoring compared with usual care.

Searching
PubMed, EMBASE and Cochrane Database of Systematic Reviews were searched from inception to October 2010 for articles published in English. Search terms were reported. Reference lists of retrieved systematic review articles were searched.

Study selection
Randomised controlled trials (RCTs) of home blood pressure telemonitoring versus usual care were eligible for inclusion. Trials had to report outcomes such as office and/or ambulatory blood pressure before and at the end of study follow-up. Definitions were provided in the review.

The included trials studied home blood pressure telemonitoring versus usual care in participants with a mean age of 58.3 to 60.5 years. The telemonitoring intervention was delivered via telephone or the Internet and often incorporated nurse visits, pamphlets or education. Most trials used office blood pressure as the primary or secondary outcome; some trials used ambulatory blood pressure. The reported blood pressure outcomes included systolic blood pressure, diastolic blood pressure, blood pressure normalisation and number of hypertension medications.

Two reviewers independently performed study selection.

Assessment of study quality
The authors did not assess trial quality.

Data extraction
Data were extracted on blood pressure outcomes and used to calculate mean differences and relative risks (RRs), together with 95% confidence intervals (CIs). Where standard deviations were not reported, these were calculated or imputed. Trial authors were contacted for missing data.

Two reviewers performed data extraction. Disagreements were resolved by consensus.

Methods of synthesis
Random-effects meta-analysis was used to calculate pooled weighted mean differences (WMD) and relative risks, together with 95% CIs. Statistical heterogeneity was assessed using $I^2$ and $X^2$ statistics. Sensitivity analysis excluded one study at a time. Publication bias was assessed using funnel plots.

Results of the review
Twelve trials (5,044 participants, range 15 to 1,657) were included in the review. Follow-up ranged from eight to 240 weeks (median 24 weeks).

Telemonitoring resulted in statistically significantly greater reductions in office systolic blood pressure (WMD -5.64,
95% CI -7.92 to -3.36; Ι²=66%; 11 comparisons) and office diastolic blood pressure (WMD -2.78, 95% CI -3.93 to -1.62; Ι²=57%; 10 comparisons) compared with usual care. Both results displayed significant heterogeneity but were not affected by the sensitivity analysis.

Telemonitoring resulted in statistically significantly greater increases in office blood pressure normalisation (RR 1.31, 95% CI 1.06 to 1.62; Ι²=78%; five comparisons) and use of blood pressure medications (WMD 0.22, 95% CI 0.02 to 0.43; Ι²=79%; five comparisons) compared with control.

Sensitivity analysis did not significantly alter the results. The funnel plots were deemed generally symmetrical.

Authors' conclusions

Home blood pressure telemonitoring may represent a useful tool to improve blood pressure control but well-designed large-scale trials were needed to demonstrate its clinical usefulness.

CRD commentary

Inclusion criteria for the review were clearly defined. Several relevant data sources were searched. There was potential for language bias as only articles in English were included. Publication bias was assessed via funnel plots; the authors believed these did not show marked asymmetry but did not rule out the possibility of publication bias. Attempts were made to reduce reviewer error and bias throughout the review process. There was no quality assessment of the included trials. Some of the included trials had small sample sizes. Trials were combined using standard statistical methods. Statistical heterogeneity was assessed. All of the outcomes had moderate to high levels of statistical heterogeneity, which may have indicated that the data was not suitable for pooling.

The uncertain quality of the evidence base and heterogeneity across studies mean that caution is warranted when interpreting the authors’ conclusions and recommendations.

Implications of the review for practice and research

Practice: The authors did not state any implications for practice.

Research: The authors stated that large-scale well-designed RCTs based on easy to use technologies and standardised procedures were needed. Further research should explore which types of telemonitoring interventions and combined interventions were most effective. Studies of add-ons of home telemonitoring compared with conventional home blood pressure monitoring should be encouraged. Future studies should aim to use more objective outcome measures such as ambulatory blood pressure. The impact of home blood pressure telemonitoring on patient quality of life, cardiovascular morbidity and mortality, and cost needed exploration.

Funding

None.

Bibliographic details


PubMedID

21654858

DOI

10.1038/ajh.2011.100

Original Paper URL

http://www.nature.com/ajh/journal/v24/n9/full/ajh2011100a.html

Indexing Status

Subject indexing assigned by NLM
MeSH
Aged; Antihypertensive Agents /therapeutic use; Blood Pressure Determination /methods; Blood Pressure Monitoring, Ambulatory /methods; Diastole; Female; Humans; Hypertension /drug therapy; Male; Middle Aged; Office Visits; Randomized Controlled Trials as Topic; Systole

AccessionNumber
12011005548

Date bibliographic record published
01/03/2012

Date abstract record published
27/09/2012

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.