Home blood pressure measurement: a systematic review
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CRD summary
This review assessed the monitoring of blood-pressure at home in comparison with that in the office. The authors concluded that although further research is required, home blood-pressure monitoring is suitable for routine clinical practice. There were a number of limitations to the review and the way it was reported that make the reliability of the results uncertain.

Authors’ objectives
To assess the use of home blood-pressure monitoring (HBPM) compared with office blood-pressure monitoring (OBPM) and to determine the number of measurements required to estimate usual blood-pressure (BP), the effect of antihypertensive treatment on HBPM, and the prognostic value of HBPM.

The review also assessed the upper limit of normal values for BP but this abstract only refers to the effects of the intervention.

Searching
PubMed, EMBASE and the Cochrane Library were searched from 1992 using the reported search terms. The reference lists in identified studies and reviews were screened.

Study selection
Study designs of evaluations included in the review
Observational studies on HBPM, published in 1992 or later, were eligible for inclusion. The studies had to adequately report the methods used to assess HBPM from original data.

Specific interventions included in the review
Studies of HBPM using a device that had been validated according to protocols of the British Hypertension Society, Association for the Advancement of Medical Instrumentation and/or the European Society for Hypertension were eligible for inclusion. The studies had to adequately describe the methods used for HBPM or self-measurement. The included studies generally used automatic or semi-automatic devices for HBPM and manual mercury sphygmomanometers for OBPM.

Participants included in the review
Inclusion criteria for the participants were not specified. Studies that involved patients receiving and not receiving antihypertensive drug treatment were only included if they reported the results separately for treated and untreated patients.

Outcomes assessed in the review
Inclusion criteria for outcomes other than BP were not specified. The review assessed the optimal number of measurements for HBPM, the difference in BP between HBPM and OBPM, the change after drug treatment in HBPM and OBPM, and the relationship between HBPM results and cardiovascular outcomes.

How were decisions on the relevance of primary studies made?
Two reviewers selected studies for inclusion. The authors did not state how any disagreements were resolved.

Assessment of study quality
The authors did not state that they assessed validity.
Data extraction
The authors did not state how the data were extracted for the review, or how many reviewers performed the data extraction. Where more than one paper was produced by the same authors, data were only included if the papers seemingly referred to different populations. The extracted data included the mathematical methods used to assess the accuracy and reliability of HBPM, the number of consecutive readings and days of HBPM and OBPM, and the average BP values for HBPM and OBPM. In the review, changes in office and home BP were treated as unpaired data.

Methods of synthesis
How were the studies combined?
Pooled weighted mean differences (WMDs) between HBPM and OBPM were calculated, along with 95% confidence intervals (CIs), for untreated participants; weighting was by the inverse of the variance. Pooled mean changes in BP after antihypertensive treatment were calculated separately for HBPM and OBPM. No details of the methods used to determine the optimal number of measurements of HBPM were given.

How were differences between studies investigated?
Linear regression was used to examine the effect of age and gender on the differences between HBPM and OBPM.

Results of the review
Four studies (n=1,182) assessed the accuracy and reproducibility of HBPM, 18 studies (n=6,979) compared HBPM with OBPM in untreated participants, 13 studies (n=8,928) compared HBPM with OBPM in treated hypertensive participants, and 8 studies (n=3,256) assessed the efficacy of drugs using HBPM and OBPM. The number of studies used to determine the relationship between HBPM and cardiovascular outcomes was not reported.

The authors stated that studies showed that a minimum of two measurements in the morning and two in the evening were required for 3 consecutive days. Readings from the first day were higher and should be disregarded.

HBPM compared with OBPM in untreated participants: the pooled WMD between HBPM and OBPM was 6.9 mmHg (95% CI: 6.6, 7.2, P<0.001) for systolic BP and 4.9 mmHg (95% CI: 4.7, 5.1, P<0.001) for diastolic BP. The difference between HBPM and OBPM in systolic BP (but not diastolic BP) increased significantly with age (P=0.036 for systolic BP). An increased proportion of male participants significantly increased the difference (P<0.01).

HBPM compared with OBPM in treated hypertensive participants: the pooled WMD between HBPM and OBPM was 5.3 mmHg (95% CI: 5.1, 5.6, P<0.0001) for systolic BP and 3.1 mmHg (95% CI: 2.9, 3.3, P<0.0001) for diastolic BP.

HBPM compared with OBPM in relation to antihypertensive treatment: the pooled mean change in BP after antihypertensive treatment was 20.1 mmHg (95% CI: 19.6, 20.7) for systolic BP and 13.6 mmHg (95% CI: 13.3, 14.0) for diastolic BP when using OBPM, and 13.9 mmHg (95% CI: 13.4, 14.4) and 9.1 mmHg (95% CI: 8.8, 9.4), respectively, when using HBPM. The decrease in systolic and diastolic BP was significantly greater with OBPM compared with HBPM (P<0.0001).

HBPM and cardiovascular outcomes: one or more studies showed that HBPM was more closely correlated with left ventricular hypertrophy, cardiovascular mortality and cardiovascular events than OBPM.

Authors’ conclusions
Further research is required but HBPM is suitable for routine clinical practice.

CRD commentary
The review addressed a fairly broad research question that was defined explicitly only in terms of the intervention. A lack of clear inclusion criteria could have increased the likelihood of subjective decisions in selecting studies for the review. Three relevant databases were searched, but no attempts were made to locate unpublished studies and this raises the possibility of missed studies and publication bias. It was unclear whether any language limitations had been applied,
so the possibility of language bias could not be assessed. Methods were used to minimise errors and bias in the study selection process (involvement of two reviewers), but it was unclear whether similar steps were taken at the data extraction stage. Since study validity was not assessed, any results of these studies and any synthesis may not be reliable.

Data for differences between HBPM and OBPM were pooled without a prior assessment of heterogeneity, so it is not certain whether the results were consistent among studies. However, the authors did examine the influence of age and gender on differences between HBPM and OBPM. There were insufficient data on the included studies to verify the reliability of the stated relationship between HBPM results and cardiovascular outcomes, and methods used to determine the optimal number of measurements for HBPM were not reported. Overall, there were a number of limitations to this review and the way it was reported, including unclear description of the inclusion criteria, the lack of a validity assessment, incompletely described review methods and inadequate presentation of some study details. This makes the reliability of the results uncertain.

Implications of the review for practice and research

Practice: The authors stated that decisions based only on HBPM should be taken cautiously until further research has been done, and that HBPM should not be promoted when it causes anxiety or encourages self-management of treatment. They also stated that established guidelines for self-monitoring of BP should be followed, patients should receive extensive training, and that HBPM devices must have been adequately validated and be equipped with memories.

Research: The authors stated that future clinical trials should use the same device, preferably an automatic one, for HBPM and OBPM.

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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.