Relative effectiveness of clinic and home blood pressure monitoring compared with ambulatory blood pressure monitoring in diagnosis of hypertension: systematic review


CRD summary
The authors concluded that neither clinic nor home measurement had sufficient sensitivity or specificity to be recommended as a single diagnostic test for hypertension. If ambulatory monitoring was taken as the reference standard, treatment decisions based on clinic or home blood pressure measurement alone might result in substantial overdiagnosis. This conclusion reflects the evidence presented and is likely to be reliable.

Authors' objectives
To determine the accuracy of clinical and home measurements compared with ambulatory blood pressure monitoring in the diagnosis of hypertension.

Searching
MEDLINE, EMBASE, the Cochrane Database of Systematic Reviews, DARE, the Medion (www.mediondatabase.nl), ARIF (Aggressive Research Intelligence Facility), and TRIP (Turning Research into Practice) databases were searched, with dates spanning from 1950 to May 2010. Search terms were reported; the MEDLINE search strategy was reported to be available. Diagnostic study filters were used. There were no language restrictions.

Study selection
Diagnostic studies that compared home and/or clinic blood pressure measurement with ambulatory readings in adult patients of any age were eligible for inclusion. Studies had to provide data to enable the construction of 2x2 tables, using clearly defined thresholds for the diagnosis of hypertension. The reference standard was ambulatory monitoring with a threshold of 135/85mmHg for mean daytime readings. Patients who were pregnant, hospitalised, or already receiving treatment were excluded.

The included patients varied widely in terms of age (mean 48.8 years; range under 33 up to 60 years), gender (percentage of men ranged from 16 to 69%; and a mean of 57% women), population (primary care or specialist; variably defined in the paper) and mean baseline blood pressure. The included studies also varied for the number of measurements at home (18 to 56), in the clinic (two to 18) and by ambulatory monitoring (24 to 111), the period of ambulatory measurement, and the blood pressure thresholds.

Two reviewers independently selected the studies.

Assessment of study quality
Study quality was assessed using an adapted version of the QUADAS (Quality Assessment of Diagnostic Accuracy Studies) checklist, covering selection criteria, time period between measurements, investigator blinding, reporting of incomplete/uninterpretable results, use of reference standard in all patients, attrition, adequate checking of self monitored readings, and equipment validation.

It appeared that more than one reviewer carried out the quality assessment.

Data extraction
Sensitivity and specificity values, and associated 95% confidence intervals (CI), were extracted for all the reported threshold combinations. Authors were contacted for additional information, where necessary.

Two reviewers carried out the data extraction. Differences were resolved by consensus.
Methods of synthesis
Studies that compared ambulatory and home monitoring were pooled separately from those that compared ambulatory and clinic monitoring. Studies were required to have a common reference and index test threshold for pooling. In the ambulatory versus home comparison, 135/85mmHg was used as the threshold for both methods. For the ambulatory versus clinic comparison studies, the ambulatory threshold was 135/85mmHg and the clinic threshold was 140/90mmHg.

A meta-analysis was carried out using hierarchical receiver operating characteristic (HSROC) models. Sensitivity analysis was conducted by including all studies to explore the differential effects of diagnostic thresholds and to assess test performance in patients with mean clinic readings at or above the diagnostic threshold.

Results of the review
Twenty studies were included in the review (n=5,863 participants; sample size range 16 to 2,370). All studies avoided partial and differential verification bias. Selection criteria and reporting of attrition was considered good. Eleven studies used validated devices for all methods of monitoring. Six studies reported the use of investigator blinding.

Of the 20 studies included, seven studies provided data for ambulatory monitoring (using a threshold of 135/85mmHg) and for clinic monitoring (with a threshold of 140/90mmHg); three studies provided data for both ambulatory and home monitoring (using a threshold of 135/85mmHg).

Compared with ambulatory monitoring at a threshold of 135/85mmHg, clinic measurement over 140/90mmHg had a mean diagnostic sensitivity of 74.6% (95% CI 60.7 to 84.8) and specificity of 74.6% (95% CI 47.9 to 90.4). Home measurement over 135/85mmHg had a mean diagnostic sensitivity of 85.7% (95% CI 78 to 91) and specificity of 62.4% (95% CI 48 to 75). There were no significant differences in mean sensitivities or specificities between the two measurement settings (home and clinic).

The results of sensitivity analyses are reported in the paper.

Authors' conclusions
Neither clinic nor home measurement had sufficient sensitivity or specificity to be recommended as a single diagnostic test for hypertension. If ambulatory monitoring was taken as the reference standard, treatment decisions based on clinic or home blood pressure measurement alone might result in substantial overdiagnosis.

CRD commentary
The review question was clear. The inclusion criteria were likely to be sufficiently replicable. The search strategy included several relevant data sources, with attempts made to minimise language bias. There did not appear to be any attempt to locate unpublished data, so studies might have been missed. Attempts appear to have been made to minimise error and bias throughout the review process.

An appropriate quality assessment tool was used. Study characteristics were provided. The chosen method of synthesis appeared to be appropriate.

The authors' conclusion reflects the evidence presented and (with a note of caution relating to potential missing studies) is likely to be reliable.

Implications of the review for practice and research
Practice: The authors stated that ambulatory monitoring might be a more appropriate targeting strategy prior to starting prolonged drug treatment, especially around the diagnostic threshold.

Research: The authors stated that the cost-effectiveness of providing ambulatory monitoring equipment should be evaluated before any changes to the diagnosis of hypertension can be recommended.
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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.