Nurse led interventions to improve control of blood pressure in people with hypertension: systematic review and meta-analysis

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CRD summary
Nurse-led interventions for hypertension in primary care that included a structured treatment algorithm were beneficial in blood pressure management, but there was insufficient evidence to support their widespread use within the UK healthcare system. The authors' conclusions seem reasonable and are likely to be reliable.

Authors' objectives
To assess the efficacy of nurse-led interventions and the importance of nurse prescribing to control blood pressure in individuals with hypertension in primary care in the UK.

Searching
MEDLINE, Cochrane Central Register of Controlled Trials (CENTRAL), British Nursing Index, CINAHL, EMBASE, DARE and NHS EED were searched for English-language articles published between 2003 and November 2009. Articles published prior to 2003 were obtained from an earlier review (see Other Publications of Related Interest). Search terms were available online. Authors were contacted for missed citations. Reference lists of included studies were searched manually.

Study selection
Randomised controlled trials that compared interventions delivered by nurses, nurse prescribers and nurse practitioners to improve blood pressure versus usual care in adults (18 years or over) with newly diagnosed or established hypertension were eligible for inclusion. Primary outcomes were systolic and diastolic blood pressure at the end of the study and changes compared to baseline, percentage of patients who reached target blood pressure and percentage who were taking antihypertensive drugs. Secondary outcomes were costs or cost effectiveness of interventions.

The included studies were from a range of countries (included USA, Canada, UK, China, Finland, Mexico, Brazil, Norway and Australia). Studies were predominantly in white participants. Some patients had comorbidities such as diabetes, renal disease and coronary heart disease. One third of studies did not describe the method used to measure blood pressure. Study durations ranged between three and 36 months; few were longer than 12 months.

Two reviewers independently screened studies for selection. Disagreements were resolved through discussion or referral to a third reviewer if necessary.

Assessment of study quality
Study quality was assessed using criteria of randomisation, allocation concealment and blinding.

Two reviewers independently performed validity assessment. Disagreements were resolved through discussion.

Data extraction
Two reviewers independently extracted the mean difference between treatment groups in blood pressure at follow-up and differences in change from baseline. The number (%) of patients who achieved target blood pressure and number who were taking antihypertensive drugs were extracted. Disagreements were resolved through discussion.

Methods of synthesis
A pooled estimate was obtained only where there was no evidence of significant statistical heterogeneity (p<0.05). Pooled relative risk (RR) and 95% confidence interval (CI) was calculated for dichotomous data. Weighted mean differences (WMDs) and 95% CIs were pooled for continuous data using a random-effects model. Studies were grouped by type of intervention.
Statistical heterogeneity was assessed using the $I^2$ statistic and $X^2$ test. Sensitivity analysis was undertaken to assess the effect of each study on the results and to assess the effects of study quality by excluding studies of poor quality. Subgroup analyses was undertaken in ethnic groups (African Americans and Chinese).

**Results of the review**

Thirty two RCTs (n=18,481, range 21 to 5,005) were included in the review; seven were cluster RCTs. Study quality was moderate: 70% of studies adequately reported randomisation; 58% reported allocation concealment; and 43% reported blinding. Sensitivity analysis that pooled only good-quality RCTs did not substantially alter the results.

**Nurse interventions that used a treatment algorithm (14 RCTs):**

There was a greater reduction in blood pressure from baseline in patients who received treatment guided by an algorithm compared with usual care (WMD -8.2mmHg, 95% CI -11.5 to -4.9; four RCTs), but no statistically significant difference between groups in achievement of study blood pressure targets (three RCTs).

**Nurse prescribing (nine RCTs):**

There was a greater reduction in blood pressure from baseline with nurse prescribing compared to usual care (systolic WMD -8.9mmHg, 95% CI -12.5 to -5.3; three RCTs and diastolic WMD -4.0, 95% CI -5.3 to -2.7; four RCTs), but no statistically significant difference in achievement of study blood pressure target (two RCTs).

**Telephone monitoring of blood pressure by nurses (seven RCTs):**

There was a statistically significant decrease in diastolic blood pressure from baseline (WMD -2.1, 95 %CI -4.1 to -0.3; three RCTs), but not for other blood pressure measurements in patients who received telephone monitoring of blood pressure by nurses compared to usual care. There was a statistically significant benefit in achievement of study blood pressure targets with telephone monitoring (RR 1.24, 95 % CI 1.08 to 1.43; three RCTs).

**Community monitoring (eight RCTs):**

Interventions delivered outside healthcare settings (such as community centres and work settings) showed a statistically significant reduction in blood pressure from baseline compared to usual care (systolic WMD -4.8mmHg, 95% CI -7.0 to -2.7; four RCTs and diastolic WMD -3.5, 95% CI -4.5 to -2.5; four RCTs).

**Nurse-led clinics (14 RCTs):**

In primary care clinics there was a statistically greater reduction in blood pressure for nurse-led clinics compared with usual care (systolic WMD -3.5mmHg, 95 % CI -5.9 to -1.1; six RCTs and diastolic WMD -1.9mmHg, 95 % CI -3.4 to -0.5; six RCTs). There were no statistically significant differences between treatment groups in achievement of study blood pressure targets (two RCTs) and there was some evidence of statistical heterogeneity ($I^2=72\%$). In secondary care clinics there were no statistical differences in blood pressure or achievement of blood pressure targets ($I^2=65\%$).

Findings for subgroup analyses by ethnic group were reported in the review.

**Cost information**

One UK study reported a cost of £28,933 per quality adjusted life year gained for additional nurse clinics and support from specialist nurses. A second UK study reported that primary care costs were £9.50 per patient compared with £5.08 for usual care. Costs were reported from one USA and one Mexican study.

**Authors’ conclusions**

Nurse-led interventions for hypertension in primary care should include a structured treatment algorithm. There was evidence from non-UK studies of improved outcomes with nurse prescribing, but there was insufficient evidence from UK primary healthcare.
CRD commentary
The review question and inclusion criteria were clearly defined. A comprehensive search of the literature was undertaken; the decision to restrict to papers published in English seemed reasonable given the topic area and the focus on UK settings. Appropriate methods were used to reduce error and bias in the review processes. Quality was assessed and considered in the analysis. Appropriate methods were used to assess statistical heterogeneity and where this was evident, no statistical pooling was undertaken. The decision to pool only good-quality studies where heterogeneity was detected meant that for some outcomes only a small number of the available studies were included. Statistical heterogeneity was still evident for some findings. Clinical sources of heterogeneity were not explored. Important limitations in the evidence were discussed; these included unclear reliability of the outcome measures used, short length of follow-up and the very small number of good-quality UK studies available. The authors' conclusions seem reasonable and are likely to be reliable.

Implications of the review for practice and research
Practice: The authors stated that nurse-led care can improve on doctor-led or usual care of hypertension. They suggested that a key component was use of a structured treatment algorithm and there was evidence in favour of nurse prescribing. Improvements were seen in primary care and community based settings, which suggested that the findings from the review can be applied to primary care clinics in the UK or equivalent community settings in other healthcare systems.

Research: The authors stated that further research in the UK was needed and should include a structured algorithm, assessment of nurse-led prescribing and economic assessment. Future studies should report absolute measures of blood pressure to permit comparison with existing literature and ensure blinding by outcome assessors to minimise bias.

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