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A cardiovascular risk clinic using home BP monitoring

Background

Hypertension is the most common chronic condition managed in general practice, but blood pressure (BP) control is often suboptimal. Home blood pressure (HBP) monitoring can be more accurate than office based BP (OBP) monitoring, with HBP readings ~10/5 mmHg lower than OBP in the same patients.

Methods

Hypertensive patients from a single general practice were invited to a cardiovascular risk review clinic using HBP monitoring. Outcome measures were BP reading, BP meeting adjusted target of 120/80 if aged <65 years or 130/85 if aged >65 years, owning home BP monitor, numbers enrolling and numbers attending 12 month follow up.

Results

Of 524 eligible patients, 414 (79%) enrolled in the clinic, of whom 89% completed the trial. At 12 months, HBP control rates rose from 29.9% to 44.8%, with mean HBP falling 5.2/3.2 mmHg ($p<0.001$). Home BP monitor ownership rose from 54.3 to 82.9%.

Discussion

This is the first study in standard Australian general practice using both a comprehensive clinic approach and HBP readings exclusively. This study provided a feasible management protocol and practical clinical performance indicators that could be used for a randomised controlled trial. Significantly better control rates were achieved compared with published studies for BP control.

■ **Hypertension is the most common chronic condition managed in general practice, comprising 6.3% of all consultations and 18.1% of all chronic disease consultations.¹ Blood pressure (BP) reduction to recommended levels reduces stroke risk by 40%,² and in isolated systolic hypertension any cardiovascular event by 25%.³ Above 115 mmHg, systolic reductions as little as 2 mmHg decrease the relative risk from stroke mortality by up to 10% and ischaemic heart mortality by 7%.⁴**

Blood pressure control is suboptimal; only 37–40%^{5,6} of hypertensive patients achieve a target BP of 140/90 mmHg. The 'white coat' effect on clinic (office) BP (OBP) is a common problem.⁷ The 2004 National Heart Foundation (NHF) hypertension guidelines suggest considering obtaining BP measurements outside the clinic for all patients, specifically for those aged <65 years with OBPs of $\geq 130/85$ mmHg and for those aged >65 years with OBPs of $\geq 140/90$ mmHg.⁷ 'Masked' hypertension, which is normal OBP and elevated ambulatory BP (ABP) or HBP, occurs at a similar frequency to white coat hypertension.⁸ Routine use of ABP or HBP will negate the effect of both phenomena.⁸

Mean BP readings obtained by ABP or HBP correlate with target organ damage and cardiovascular events better than does OBP.⁷ The normal range of HBP is not the same as OBP; HBP readings are approximately 10/5 mmHg lower than OBP in the same patients.⁹ A large 2007 study¹⁰ confirmed day time ABP targets of $\leq 120/80$ mmHg for patients aged <65 years as the optimal hypertension control range. Home BP and mean day time ABP measurements are very similar (mean difference $-1.7/+1.2$ mmHg).⁹ Ambulatory BP monitors are expensive, but HBP monitors are affordable.

The NHF hypertension guidelines recommend comprehensive cardiovascular risk factor management.⁷ Using nurses for BP control is both effective¹¹ and acceptable to patients.¹² Current diabetes management includes an annual 'cycle of care'.¹³ Hence, the authors decided to develop a combined nurse-general practitioner cardiovascular risk clinic protocol with structured measurement of HBP as an annual 'cycle of care' for hypertension.

Methods

Study sample

The study was in a group general practice in a regional Australian city from May 2005. Patients were identified via a medical record search for 'hypertension' and 'blood pressure'. All age groups were included. Practice policy since 2000 had required a reason to be entered for all prescriptions, providing an accurate data base.

Patients were excluded if their last prescription for hypertensive medicines was more than 12 months ago (as assumed to be treated elsewhere), if they were known to be transient or to have left the practice, or if the diagnosis was other than hypertension (eg. pulmonary hypertension).

The practice nurse applied exclusion criteria by reviewing patient records.

Intervention

The authors designed a combined nurse-GP protocol driven cardiovascular risk review clinic. The protocol included the NHF recommended screen for target organ damage and associated clinical conditions,⁷ smoking, nutrition, alcohol, physical activity (SNAP),¹⁴ sleep apnoea, chronic kidney disease (CKD) screening, and a calculation of cardiovascular risk (New Zealand risk calculator). Target for HBP was set at 120/80 mmHg for patients aged <65 years and 130/85 mmHg for those aged >65 years.

Each patient identified was mailed an invitation to the cardiovascular risk clinic. One week later, patients who had not responded were contacted once by telephone and the invitation repeated.

Patients made two appointments. The first was for instruction in HBP and supply of a pathology form. The second appointment, 1 week later, involved a 45 minute session with the nurse followed by a 20 minute session with the GP. The consultation was charged as General Practice Management Plan (GPMP) item 721.

All patients with BP above NHF recommendations were requested to return to see the GP in 1 month, bringing an additional week of HBP readings. Monthly review was to continue until adequate control was achieved or therapeutic options exhausted.

Once the patient was within the NHF guidelines, recall was at 6 months for a visit with 14 HBP readings. The next full assessment was 12 months after the first. Other problems detected were subject to usual GP care.

Major outcome measures

The following were measured at baseline and 12 months:

- mean systolic and mean diastolic HBP (14 readings)
- percentage of participants within NHF 2004 BP guidelines (redefined for HBP)
- percentage of participants owning HBP monitors
- percentage of hypertensive patient enrolling

- percentage of patients enrolled attending 12 month follow up. Cardiovascular risk factors and significant cardiovascular diseases at exit were also recorded.

Analysis

Significance was calculated using McNemar's test for paired categorical variables, and two-tailed paired sample t-tests for continuous variables. The χ^2 test was used to measure correlation of categorical variables at one time point, and analysis of variance was used as a test of correlation of continuous variables at one time point. Significance was set at $p < 0.05$. Calculations were performed using the SPSS version 14 statistical software package.

Ethical approval was obtained from The Royal Australian College of General Practitioners National Research and Evaluation Ethics Committee.

Results

Of 524 patients identified with hypertension, 414 (79%) were recruited and 368 (88.9%) completed the trial. Reasons for the 46 withdrawals from the study were recorded as follows: left town (10), major medical or social problems prevented attendance (8), left practice (7), specialist care (5), died (5), admitted to nursing home (2), unknown (9). The group that completed the study was similar to that which withdrew (*Table 1*).

Blood pressure control rates using NHF criteria rose from 29.9 to 44.8%. Had the 140/90 criteria been used, the control rates would have risen from 42.9 to 55.4% (*Table 2*).

Mean systolic HBP fell a mean of 5.2 mmHg at 12 months (95% CI: 3.8–6.6, $p < 0.001$), and mean diastolic HBP fell by 3.2 mmHg (95% CI: 2.4–3.9, $p < 0.001$). Home BP monitor ownership increased significantly (54.3–82.9%, $\chi^2 = 53.8$, $p < 0.001$) over 12 months. Initial monitor ownership did not predict completion ($\chi^2 = 0.50$, $p = 0.48$).

The mean consultation time for the nurse was 32 minutes (standard deviation [SD]: 9.9 minutes) and 18 minutes (SD: 6.2 minutes) for the GP. Two hundred and thirty-one (63%) of patients who completed the study had at least one of the eight comorbidities listed in *Table 1*.

Discussion

This is the first study in standard Australian general practice using both a comprehensive clinic approach and HBP readings exclusively. Another approach not usually reported in general practice based hypertension studies was the use of BP targets adjusted for HBP as the mode of measurement. While the importance of BP was emphasised in the clinic, it was just one component of a comprehensive approach to cardiovascular risk factor identification and management.

The protocol was designed to overcome doctor therapeutic inertia by four mechanisms:

- a standardised process was developed by, and adhered to, by all doctors¹⁵
- it was the role of the nurse to determine whether BP was controlled

Table 1. Characteristics of study completers and noncompleters

	Completers (n=368)	Noncompleters (n=46)	p
Male (%)	48.6	47.8	0.52 [†]
Age (mean years [SD])	66.0 (11.2)	64.5 (12.7)	0.77
Systolic HBP (mmHg) (mean [SD])	134 (15)	135.9 (15.7)	0.42
Diastolic HBP (mmHg) (mean [SD])	74.9 (9.3)	76.1 (7.7)	0.39
Smokes (%)	3.8	6.5	0.29 [†]
Adequate nutrition* and BMI <25 (%)	18.2	15.2	0.40 [†]
Drinks alcohol within SNAP safety limits (%)	97.6	95.7	0.35
Inadequate physical activity* (%) (SNAP guidelines)	49.2	52.2	0.41 [†]
Lipid lowering agent use rate	44.6	43.5	0.509 [†]
Obstructive sleep apnoea on CPAP (%)	7.9	2.2	0.12 [†]
Ischaemic heart disease (%)	20.1	23.9	0.33 [†]
Congestive heart failure (%)	4.9	4.3	0.61 [†]
Atrial fibrillation (%)	7.1	6.5	0.59 [†]
Peripheral vascular disease (%)	3.2	4.3	0.54 [†]
Cerebrovascular disease (%)	7.3	10.9	1.15 [†]
Diabetes (%)	23.9	26.1	0.43 [†]
Impaired glucose tolerance (%)	31.5	32.6	0.50 [†]
Chronic kidney disease categories 3–5** (%)	17.4	8.7	0.09 [†]

SD = standard deviation, HBP = home blood pressure, BMI = body mass index, SNAP = smoking, nutrition, alcohol, physical activity, CPAP = continuous positive air pressure

* Self reported

** Kidney Health Australia categories

† Fishers exact test

- monthly follow up was required of the GP with alteration of medication until control of BP achieved or therapeutic options exhausted
- increased certainty for GPs in having 14 readings on which to base decisions about altering medication, rather than a single office reading.

The protocol was also designed to improve patient compliance by promoting the purchase of a HBP monitor as this has been shown to be effective.¹⁶

Twenty-one percent of practice patients did not respond to the enrolment invitation, and there was an 11.1% study dropout rate. The results could therefore have arisen because the patients who remained in the study were more compliant. However, there were no significant differences in any parameter at enrolment between those who failed to complete and those who completed (*Table 1*). There were multiple reasons for dropout, with no discernable pattern.

The NHF criteria for BP control are more stringent than many studies, which use a cut off of 140/90 mmHg.⁷ The Australian National Primary Care Collaboratives Program currently uses 140/90 mmHg as its OBP goal for patients of all ages with coronary artery disease.¹⁷

Even using a lower cut off BP, which has been confirmed by a large 2007 study,¹⁰ we achieved almost 50% improvement in control of BP according to NHF criteria. We achieved a greater decrease of 5.2/3.2 mmHg systolic BP/diastolic BP than did a 2004 meta-analysis of 18 HBP randomised controlled trials, which reported a mean decrease of

4.2/2.4 mmHg systolic BP/diastolic BP.¹⁸

Home BP monitor ownership rose significantly from an already high baseline (the practice had been opportunistically promoting HBP before the study).

The majority of hypertensives had a related chronic disease. This emphasises hypertension as an indicator to perform a full cardiovascular risk assessment. Medicare does not regard isolated hypertension as a chronic disease, so a GPMP item cannot be charged. However, a GPMP can be charged if there is target organ damage, associated clinical conditions or another unrelated chronic disease. This produces a 'catch 22' for the practice where billing is concerned. The practice cannot find out if there is hypertension alone without performing a comprehensive review. A 'cycle of care' item number approach similar to that for diabetes may be a solution.

This study acts as a pilot, providing a feasible management protocol and practical clinical performance indicators that could be used for a randomised controlled trial. It achieved significantly better control rates than published studies for this, the most common chronic condition in general practice, using the latest BP control recommendations.

Limitations of this study

This was a small study in a single practice. This was not a controlled trial, so the results cannot be attributed to the intervention with certainty. The practice had been opportunistically using SNAP and HBP before the study, which may have helped to develop a compliant patient population.

Table 2. Blood pressure at baseline and 12 months (n=368)

	Baseline	12 months	95% CI for difference	p
Systolic HBP	134.0	128.8	3.8–6.6	<0.001
Diastolic HBP	74.9	71.8	2.4–3.9	<0.001
Within NHF guidelines (%)	29.9	44.8	–	<0.001
At or below 140/90 (%)	42.9	55.4	–	<0.001
HBP ownership (%)	54.3	82.9	–	<0.001

Conflict of interest: none declared.

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