

Blood pressure control in treated hypertensive patients: clinical performance of general practitioners

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SUMMARY

Background: The blood pressure of many treated hypertensive patients remains above recommended target levels. This discrepancy may be related to general practitioners' (GPs') actions.

Aim: To assess clinical performance of GPs in blood pressure control in treated hypertensive patients and to explore the influence of patient and GP characteristics on clinical performance.

Design of study: Cross-sectional study conducted on 195 GPs with invitations to participate made via bulletins and by letter.

Setting: One hundred and thirty-two practices in the southern half of The Netherlands from November 1996 to April 1997.

Method: Performance criteria were selected from Dutch national hypertension guidelines for general practice. GPs completed self-report forms immediately after follow-up visits of hypertensive patients treated with antihypertensive medication.

Results: The GPs recorded 3526 follow-up visits. In 63% of these consultations the diastolic blood pressure (DBP) was 90 mmHg or above. The median performance rates of the GPs were less than 51% for most of the recommended actions, even at a DBP of ≥ 100 mmHg. Performance of non-pharmacological actions increased gradually with increasing DBP; prescribing an increase in antihypertensive medication and making a follow-up appointment scheduled within six weeks rose steeply at a DBP of 100 mmHg. Patient and GP characteristics contributed little to clinical performance. Action performance rates varied considerably between GPs.

Conclusion: GPs seem to target their actions at a DBP of below 100 mmHg, whereas guidelines recommend targeting at a DBP of below 90 mmHg.

Keywords: blood pressure; hypertension; guidelines; task performance and analysis.

Introduction

GUIDELINES from national and international committees recommend blood pressure targets for the pharmacological treatment of hypertension.¹⁻³ Treatment of hypertension aims to reduce a patient's risk of developing coronary artery disease and stroke.^{4,5} A major determinant of the risk reduction is the level of blood pressure achieved.⁶ The guidelines recommend that systolic blood pressure (SBP) should be reduced to below 130–150 mmHg and diastolic blood pressure (DBP) should be reduced to below 85–90 mmHg. These target values were derived from trials that studied the efficacy of antihypertensive drugs. The targets are set to stimulate doctors and patients to actually reach these levels and to achieve optimal benefit from pharmacological treatment. However, studies show that 60%–69% of treated hypertensive patients in general practice do not reach the recommended targets; they have a DBP of ≥ 90 mmHg or a SBP of ≥ 160 mmHg.⁷⁻⁹ Hypertension is a common condition in general practice with a prevalence of 5%.¹⁰ Therefore, treated but uncontrolled hypertension is a major problem in preventive health care.

The discrepancy between recommended blood pressure targets and actual levels may be related to doctors' clinical performance. In many countries, hypertension is almost entirely managed by general practitioners (GPs). It would therefore be worthwhile to investigate which blood pressure targets GPs apply in daily clinical practice and how and to what extent they try to achieve these targets.

The primary objective of this study was to assess clinical performance of GPs in blood pressure control in treated hypertensive patients and the variation between GPs. The secondary objective was to estimate the influence of patient and GP characteristics on clinical performance. Assessment of clinical performance may provide insight into the quality of actual care, the pursuit of recommended targets, and the effectiveness of clinical actions.

Method

Study design and subjects

We conducted a cross-sectional study on 195 GPs in 132 practices in The Netherlands from November 1996 to April 1997. This study served as a baseline for an intervention trial to optimise the quality of cardiovascular care. GPs in the southern half of The Netherlands were invited by letter and via bulletins to participate. The participating GPs identified hypertensive patients treated with antihypertensive medication who came for a follow-up visit. We excluded all patients aged under 18 or over 80 years.

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Measurements

In 1991, the Dutch College of General Practitioners issued national guidelines for the detection and management of hypertension.¹¹ We used these clinical guidelines to select key recommendations for the management of uncontrolled blood pressure in treated hypertensive patients. These guidelines are based on scientific evidence, broad consensus, and clinical experience.¹² Most Dutch GPs are familiar with the guidelines six to 12 months after publication.¹³ The target for pharmacological treatment in the 1991 Dutch hypertension guidelines is a DBP of ≤ 90 mmHg (whereas other national and international guidelines recommend < 90 mmHg¹⁻³). The selected key recommendations included four recommendations for non-pharmacological measures, one for pharmacological treatment, and one for follow-up (Box 1).

A self-report form was developed to assess clinical performance of GPs with respect to the 1991 Dutch hypertension guidelines. This form included items to assess age, sex, and clinical characteristics of the patient, as well as items to assess whether specific actions were performed by the GP. The questions on patient characteristics could be answered with yes (present), no (absent), and with a question mark (unknown); these items concerned smoking, a body mass index of ≥ 30 kg/m², excessive alcohol intake, and target organ damage (heart failure, stroke, or impaired renal function). The actions could be scored with yes (action performed) and no (action not performed). The DBP and the period until the next follow-up appointment could be filled in as mmHg and weeks, respectively.

Characteristics of the GPs were determined using a questionnaire filled in by one GP per practice. Data were collected on age, sex, and working hours of the GPs, type of practice (single-handed versus partnership), and list size. The practice location was classified as urban if the number of registered addresses in that area exceeded 1500 per square kilometre.

Procedure

Each GP recorded follow-up visits of hypertensive patients during a period of two months. Research assistants visited the practices at the start of the recording period to explain the use of the self-report forms. The GPs were asked to complete the forms immediately after a follow-up visit. The GPs were not allowed to screen the patient's record after the visit: only information that the GP was aware of during the visit was to be recorded on the form. Another study showed that GPs complete these kinds of self-report forms reliably (average kappa = 0.76).¹³

Analysis

Any visits in which the GP decided to consult a specialist or to refer the patient for treatment of hypertension were excluded, as consulting a specialist may influence the performance of other actions by a GP. Actions with a missing score (0.2%–2.4%) were considered 'not performed', whereas missing scores for patient characteristics (0%–2.3%) were excluded from the analyses. The scores for GP characteristics were complete.

The follow-up visit was the unit of analysis to describe clinical performance. DBP was categorised into five groups, according to the presence of a substantial number of DBP registrations of 90, 95, 100, and 105 mmHg. For each DBP category, the clinical performance of the six recommended actions was expressed as the percentage of visits in which the GPs had performed each recommended action. The performance of one combination of actions was also studied: prescribing an increase in antihypertensive medication (increasing the dose or starting a drug from a different class) is considered most appropriate if combined with follow-up within six weeks.¹¹

Multilevel logistic regression analysis (Glimmix procedure in SAS) was used to assess the influence of the independent variables on clinical performance and to calculate variance parameters. Multilevel analysis takes into account the relatedness of patients within the practice of one GP. The six actions and the single combination were used as binary (i.e. either the action had been performed or it had not) dependent variables. The independent variables in the stepwise procedures were the GP, the DBP, and the patient and GP characteristics. Only GPs who had recorded nine or more visits were included in the multilevel analysis to ensure enough within-GP observations. The DBP categories 100–104 mmHg and ≥ 105 mmHg were combined to ensure enough between-GP observations. After controlling for the independent variables, we calculated the intraclass correlation, which is defined as the variance between GPs divided by the total variance.¹⁴ Furthermore, we calculated the variance explained by the statistically significant variables ($P < 0.05$).¹⁵

Furthermore, clinical performance was calculated with the GP as the unit of analysis to assess the variation in action performance rates. For each action and the single combination of actions, performance per DBP category was expressed as the 25th percentile, median, and 75th percentile (owing to the non-normal distribution) of the rate of recommended actions per individual GP. To enhance reliability, these calculations included only GPs who had recorded three or more visits within each DBP category; the DBP categories 100–104 mmHg and ≥ 105 mmHg were combined.

Results

GPs, follow-up visits, and patients

The GPs (Table 1) constituted a representative sample ($n = 195$) of all Dutch GPs with regard to age, sex, type of practice, and practice location. However, the sample included fewer GPs who were full-time or who were employed for more than 0.8 full-time equivalents (65.1% versus 73.9% on a national level, $P < 0.01$, chi-square test).¹⁶ National figures for distribution of list size were not available.

The GPs reported 3704 follow-up visits with treated hypertensive patients aged between 18 and 80 years. A total of 161 forms (4.3%) were excluded because of a positive statement or missing value about referral to a specialist for hypertension during that particular visit. A further 17 forms (0.5%) were excluded because the DBP value was missing; this left 3526 forms from 3337 patients and 195 GPs for analysis (mean = 18 forms per GP, SD = 8, range = 1–49).

Table 1. Characteristics of the participating general practitioners (n = 195) and patients (n = 3526)^a.

Characteristic	Percentage of participants
General practitioners	
Aged ≥45 years	47.2
Male	77.9
Single-handed practice	42.1
Urban practice location ^b	46.7
Employment >0.8 FTE ^c	65.1
List size (patients) per FTE ^c GP	
Fewer than 2350	27.7
2350–2750	45.1
More than 2750	27.2
Patients	
Diastolic blood pressure (mmHg)	
<90	36.9
90–94	26.3
95–99	14.0
100–104	12.8
≥105	10.0
Aged ≥60 years	58.3
Male	39.9
Smoking	
Yes	14.3
No	80.0
Unknown to GP	5.7
Body mass index ≥30 kg/m ²	
Yes	21.3
No	68.2
Unknown to GP	10.5
Excessive alcohol intake	
Yes	2.5
No	87.2
Unknown to GP	10.3
Heart failure, stroke or impaired renal function	
Yes	9.3
No	86.0
Unknown to GP	4.7

^aIn patients with more than one follow-up visit, each visit was counted separately; ^b≥1500 addresses per km²; ^cfull-time equivalent.

Characteristics of the patients in these visits are presented in Table 1. The mean DBP was 91.0 mmHg (SD = 9.6). The DBP was below 90 mmHg in 38.9% of the follow-up visits, 90 mmHg in 23.2%, and above 90 mmHg in 39.9%.

Clinical performance in relation to DBP

Table 2 shows the clinical performance in relation to the DBP categories. The compliance of the patient with therapy was regularly discussed (69.6%–83.5%), whereas other potential causes of elevated blood pressure were explored less frequently (below 55% in all categories). Application of non-pharmacological measures increased gradually with increasing DBP. Prescribing an increase in antihypertensive medication, making a follow-up appointment scheduled within six weeks, and a combination of these actions rose steeply at a DBP of ≥100 mmHg to 46.3%, 67.2%, and 39.5%, respectively.

Attributes of clinical performance

Twenty-five GPs (12.8%) had recorded fewer than nine visits and so their 117 forms (3.3%) were excluded from the multi-level analysis. These 25 GPs had more often a single-handed

The following aspects need attention at follow-up visits of hypertensive patients of 18–80 years with a diastolic blood pressure >90 mmHg despite antihypertensive medication:

Potential causes of an elevated blood pressure.

Discuss:

1. compliance with therapy;
2. salt consumption;
3. alcohol intake; and
4. body weight.

Pharmacological treatment

5. Increase the antihypertensive medication (increase the dose or start a drug from a different class).

Follow-up

6. Make a follow-up appointment scheduled within six weeks.

Box 1. Recommendations from 1991 Dutch national hypertension guidelines for general practice.

practice, an urban practice location, and were more often employed for 0.8 full-time equivalents or less, compared with the other 170 GPs ($P < 0.05$, chi-square test).

Attributes ($P < 0.05$) of clinical performance are presented in Table 3. Statistically significant GP characteristics in the 195 participants and the 25 exclusions did not predict clinical performance. A DBP of ≥100 mmHg proved to be a strong predictor of prescribing an increase in antihypertensive medication, making a follow-up appointment scheduled within six weeks, and a combination of these actions (odds ratios = 20.4–36.2). As expected, excessive alcohol intake and a body mass index of ≥30 kg/m² were strong predictors of discussions about alcohol intake (odds ratio = 10.2) and body weight (odds ratio = 11.2) respectively. GPs aged 45 years or more applied non-pharmacological measures more frequently than younger GPs. Conversely, patients aged 60 years or more received non-pharmacological measures less frequently than younger patients. The intracluster correlation in the final step of the models was higher for non-pharmacological measures (0.30–0.40) than for pharmacological treatment and follow-up (0.10–0.16). Conversely, the explained variance for pharmacological treatment and follow-up (31%–32%) was higher than for non-pharmacological measures (4%–22%).

We explored whether interaction of DBP level with the number of additional risk factors (60 years of age or more; male; smoker; body mass index ≥30 kg/m²; target organ damage) predicted performance of 'prescribing an increase in antihypertensive medication' and 'making a follow-up appointment scheduled within six weeks', respectively. The number of additional risk factors was categorised in three classes: no risk factor ($n = 471$); 1 to 2 risk factors ($n = 2551$); three or more risk factors ($n = 387$). The interaction term was not statistically significant ($P < 0.05$) associated with the two clinical actions.

Variation in action performance rates

The variation in action performance rates of the GPs was considerable. There was widespread variation (interquartile range = 33%–67%) in the individual application of non-pharmacological measures in all four DBP categories. The

Table 2. Clinical performance in relation to diastolic blood pressure (DBP, mmHg). Percentage of follow-up visits in which the general practitioners performed the recommended action.

Action	DBP <90 n = 1302 (190 GPs)	DBP = 90–94 n = 927 (184 GPs)	DBP = 95–99 n = 492 (166 GPs)	DBP = 100–104 n = 454 (161 GPs)	DBP ≥105 n = 351 (134 GPs)	DBP ≥100 n = 805 (176 GPs)
Discussion of compliance with therapy	69.6	74.4	76.4	79.1	83.5	81.0
Discussion of salt consumption	31.7	37.0	40.7	46.3	54.1	49.7
Discussion of alcohol intake	22.3	25.4	29.5	28.9	28.5	28.7
Discussion of body weight	32.3	38.7	40.7	42.1	42.7	42.4
Increase in antihypertensive medication	3.4	6.2	15.0	39.4	55.3	46.3
Follow-up appointment within six weeks	10.5	13.4	29.7	58.6	78.3	67.2
Increase in antihypertensive medication combined with a follow-up appointment within six weeks	1.8	4.2	10.2	32.4	48.7	39.5

interquartile range for prescribing an increase in antihypertensive medication rose with increasing DBP from 0% to 42%, whereas the interquartile range for follow-up varied from 17% to 50%. Table 4 shows the variation at a DBP of ≥100 mmHg.

Discussion

This study addressed the clinical performance of GPs in blood pressure control in treated hypertensive patients. The median performance rates of the GPs were less than 51% for most of the recommended actions, even at a DBP of ≥100 mmHg. GPs' attention to potential causes of elevated blood pressure increased gradually with increasing DBP; GPs seemed not to expect any substantial effect from non-pharmacological treatment on DBP. GPs started to increase the antihypertensive medication and to make a follow-up appointment scheduled within six weeks substantially more often at a DBP of ≥100 mmHg. There seemed to be a threshold at a DBP of 100 mmHg; this threshold contrasts with the target level of <90 mmHg recommended in national and international guidelines. In general, and apart from the DBP level, the patient and GP characteristics in this study had little effect on clinical performance. Furthermore, there was marked variation in the action performance rates of the individual GPs, even at a DBP of ≥100 mmHg. After controlling for the DBP and other independent variables we found that 30%–40% of the variation for non-pharmacological measures and 10%–16% of the variation for pharmacological treatment and for follow-up occurred at the GP level. This means that GPs had little influence on the variation in pharmacological treatment and follow-up, whereas patient determinants were more relevant.

Do these results indicate shortcomings in care? First, the GPs seemed to target their actions at a DBP of <100 mmHg. This might be one of the reasons why 63% of the patients in this study had a DBP of ≥90 mmHg. Accepting a DBP of between 90 and 100 mmHg does not allow the patient to receive the optimal benefit from the drug treatment.⁶ Secondly, median performance rates of key actions were below 51%. We must, however, be careful when speaking in terms of shortcomings, because we did not enquire about GPs' motivations for seemingly ignoring the recommendations.

The results of this study differ from those reported by Dickerson *et al.*¹⁷ Two-thirds of 125 British GPs answered that they applied a DBP of ≤90 mmHg as target level for

most patients; 31% applied 91–95 mmHg, and 5% applied 96–100 mmHg. British GPs chose their target level more in line with the guidelines than our Dutch GPs. However, achieved blood pressure is unrelated to stated target levels.¹⁸ Self-reporting of consultations is thought to be a more appropriate method for assessing actual clinical performance than a questionnaire.¹⁹

The GPs in the study seemed to control blood pressure with reference to the blood pressure reading alone. The presence or absence of the other risk factors in our study seemed not to influence the DBP target level. Stratification of patients in terms of their total cardiovascular risk has been advocated for setting the blood pressure targets that should be achieved and the intensity with which these targets should be pursued.¹ Recent guidelines provide specific (lower) blood pressure targets for diabetic patients.^{1–3}

Former studies have shown marked between-practice variation in the percentage of treated hypertensive patients with uncontrolled blood pressure.^{9,20,21} Although guidelines on hypertension are inconsistent in their recommendations,²² it appears that practices are either more conservative or more progressive in their management of hypertension, irrespective of which guideline is applied.²¹ This suggests that there are other factors that determine between-practice variation. We found that variation in prescribing an increase in antihypertensive medication and making a follow-up appointment scheduled within six weeks occurred predominantly at the patient level. Berlowitz *et al* identified several predictors of an increase in antihypertensive medication: increased levels of both systolic and diastolic blood pressure at the visit, a change in therapy at the preceding visit, and a scheduled visit. Blood pressure recorded during previous visits and cardiovascular risk factors other than hypertension are not associated with an increase in antihypertensive medication.²³ Further research is needed to assess the influence of patient determinants (for example, compliance with therapy) and GP determinants on clinical performance and more specifically on targets set by GPs.

Several factors may have biased our results. The GPs were included after they had agreed to take part in an intervention project to optimise prevention and management of cardiovascular disease. They may therefore have had special interest and hence may have performed more favourably. It is also possible that the GPs selectively recorded visits in which they had adhered to the guidelines. Self-reporting may positively influence clinical performance,

Table 3. Odds ratios (95% confidence intervals) for attributes ($P < 0.05$) of clinical performance; variance parameters.

Attribute	Action						
	Discussion of compliance with therapy	Discussion of salt consumption	Discussion of alcohol intake	Discussion of body weight	Increase in medication	Follow-up appointment ≤ 6 weeks	Increase in medication combined with a follow-up appointment ≤ 6 weeks
GPs ($n = 195$)							
Age ≥ 45 years	1.89 (1.16–3.13)		1.92 (1.18–3.13)	1.82 (1.23–2.70)			
Urban practice location ^a				0.50 (0.33–0.74)			
Patients ($n = 3526$) ^b							
DPB (mmHg)							
<90	1.00	1.00	1.00	1.00	1.00	1.00	1.00
90–94	1.18 (0.95–1.47)	1.33 (1.08–1.63)	1.17 (0.92–1.47)	1.22 (0.98–1.52)	1.82 (1.24–2.69)	1.36 (1.04–1.77)	2.32 (1.39–3.87)
95–99	1.62 (1.23–2.13)	1.72 (1.33–2.22)	1.50 (1.13–1.99)	1.51 (1.16–1.97)	4.98 (3.40–7.28)	3.89 (2.96–5.12)	5.86 (3.56–9.65)
≥ 100	2.58 (2.01–3.31)	2.78 (2.23–3.48)	1.53 (1.20–1.96)	1.42 (1.13–1.79)	26.7 (19.3–37.0)	20.4 (16.0–26.1)	36.2 (23.6–55.6)
Age ≥ 60 years	0.76 (0.63–0.91)		0.72 (0.60–0.88)	0.71 (0.60–0.85)			
Male			1.43 (1.18–1.72)				
Smoking							
Yes	1.38 (1.06–1.80)	1.59 (1.26–2.00)	1.97 (1.54–2.53)	1.08 (0.85–1.38)	1.27 (0.95–1.69)	1.28 (0.99–1.64)	
No	1.00	1.00	1.00	1.00	1.00	1.00	
Unknown to GP	0.67 (0.46–0.96)	0.68 (0.46–1.00)	0.25 (0.13–0.47)	0.61 (0.40–0.91)	1.64 (1.05–2.57)	1.67 (1.15–2.41)	
Body mass index ≥ 30 kg/m ²							
Yes		1.41 (1.15–1.72)		11.2 (8.94–14.0)			
No		1.00		1.00			
Unknown to GP		1.02 (0.75–1.38)		1.49 (1.09–2.04)			
Excessive alcohol intake							
Yes			10.2 (5.58–18.6)	1.64 (0.95–2.83)			
No			1.00	1.00			
Unknown to GP			0.24 (0.15–0.39)	0.69 (0.50–0.95)			
Heart failure, stroke, or impaired renal function							
Yes						1.31 (0.96–1.78)	
No						1.00	
Unknown to GP						1.73 (1.15–2.61)	
Variance parameter (proportion)							
Intracluster correlation (in final step)	0.40	0.38	0.40	0.30	0.13	0.16	0.10
Explained variance	0.04	0.04	0.04	0.22	0.31	0.31	0.32

^aUrban practice location: ≥ 1500 addresses per km²; ^bin patients with more than one follow-up visit, each visit was counted separately.

Table 4. Action performance rates (%) of general practitioners^a (n = 127) in follow-up visits (n = 733) with a diastolic blood pressure ≥ 100 mmHg.

Action	Q ₁ ^b	Median	Q ₃ ^c
Discussion of compliance with therapy	67	100	100
Discussion of salt consumption	22	50	80
Discussion of alcohol intake	0	22	40
Discussion of body weight	25	40	67
Increase in antihypertensive medication	25	44	67
Follow-up appointment within six weeks	50	71	88
Increase in antihypertensive medication combined with a follow-up appointment within six weeks	20	38	58

^aGPs who registered ≥ 3 follow-up visits with a DBP of ≥ 100 mmHg; ^b25th percentile; ^c75th percentile.

especially if repeated recording guides the doctor in the required direction. In all these cases, the observed clinical performance will overestimate actual performance.

In many visits, the GPs in this study accepted DBP levels that were above the recommended target level of 90 mmHg. The GPs seemed to target their actions at a DBP of below 100 mmHg. More aggressive therapy by GPs may improve blood pressure control²³ and reduce cardiovascular morbidity and mortality.

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HOW THIS FITS IN

What do we know?

The blood pressure of more than half of treated hypertensive patients remains above recommended target levels.

What does this paper add?

GPs seem to target their actions at a diastolic blood pressure of below 100 mmHg, whereas guidelines recommend targeting at a diastolic blood pressure below 90 mmHg. More aggressive therapy by GPs may improve blood pressure control.

