Home Recording of Blood Pressure in the Management of Hypertension

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Summary

One hundred patients with uncomplicated hypertension (B.P. mean — 146/89 mmHg; range — 124/66 — 210/110 mmHg) entered a cross-over study consisting of a nine week period of home recording and clinic measurement of blood pressure and a nine week period of clinical measurement of blood pressure only. 17 patients were withdrawn. In the 83 patients who completed the study there was no significant mean difference between home and clinic pressures. Clinic blood pressure decreased during the study period but this was unrelated to home recording by the patient and was not observed in home recordings. This tendency for blood pressure to fall during repeated clinic visits is not reflected in blood pressure outside the clinic and probably represents the patient becoming accustomed to clinic measurement. Home recording of blood pressure is a feasible method of obtaining additional measurements of blood pressure outside of the clinic environment.

Home recording of blood pressure has been advocated as a method of assessing blood pressure behaviour outside the clinic.[1,2] Most studies have shown that patients[3-6] or their relatives achieve a degree of accuracy using the auscultatory technique comparable with trained medical staff, after only a short period of training.[3,7,8] It has also been suggested that home recordings may have a blood pressure lowering effect in both treated and untreated hypertensive subjects.[9-11] In this study the effect of home recording on blood pressure control is assessed in both treated and untreated subjects.

Patients and Methods

One hundred patients attending two hypertension clinics with primary uncomplicated hypertension, all of whom were in sinus rhythm and who were willing to either measure their own blood pressure or to have a relative measure it entered the study. They were randomised to either a nine week period of home-recording with clinic visits every three weeks or a period of clinic visits only for nine weeks without home recording. Patients were then crossed over to the alternative regimen for a further nine weeks. 17 patients were withdrawn. One patient took infrequent home recordings, five patients could not attend the clinic regularly, five patients required treatment modification, and two suffered a myocardial infarction; a further patient, a 72-year-old lady, failed to achieve accuracy in self-recording of blood pressure. Thus, 83 patients (47 male, 36 female) were included in the final analysis. The mean age (±SEM) was 54.3 ± 1.06, and ranged from 26 to 71 years. Thirty-three patients were normotensive at the initial clinic visit; blood pressure in the remaining 50 patients was greater than 150/90 mmHg on at least one of these visits. The mean blood pressure, standard deviation and range for all 83 patients was — systolic 146 ± 19.9, 124 – 210 mmHg; diastolic 89 ± 10.3, 66 – 110 mmHg. The corresponding values in the hypertensive group at the second clinic visit were 157 ± 16.8, 124 – 210 mmHg, and 94 ± 8.6, 70 – 110 mmHg. One patient had a relative record her blood pressure. Treatment remained unchanged throughout the duration of the study. Clinic blood pressure was recorded in the sitting position (after three minutes rest) in the left arm using a standard mercury sphygmomanometer.

With one exception, patients volunteered to measure their own blood pressure rather than have it recorded by a relative. Groups of 4-6 patients attended separate training sessions consisting of a practical demonstration in blood pressure measurement and individual training by medical staff. Half of the patients were trained to use an aneroid sphygmomanometer and a standard cuff (12×22 cm) with a built in stethoscope-head for easy application. The remaining subjects were trained to use a mercury sphygmomanometer with a standard cuff (12×22 cm) and a separate stethoscope. After practising self-recording on themselves and other patients for 20 minutes, patient accuracy in recording blood pressure was assessed by medical staff using a dual-channel binaural stethoscope. Following practice at home for one week, accuracy was reassessed and considered acceptable if the difference of the means of two consecutive recordings of systolic and diastolic blood pres-

sures by the patient and doctor did not exceed 5 mmHg. Patients failing to achieve the required accuracy were reassessed one week later after further practice at home, and withdrawn from the study if the required accuracy was not achieved. Blood pressure was recorded at home twice daily (between 0700 and 1000 hr and 1700 and 2000 hr) after sitting quietly with the arm supported for 3 minutes. Disappearance of Korotkov sounds was recorded as diastolic pressure. At the end of the period of home recording, accuracy of the patients' sphygmomanometers was assessed against a standard mercury sphygmomanometer.

Home-recorded and clinic-recorded pressures were compared by comparision of means, by calculating the mean and standard deviation of the differences between methods, and by constructing scatter plots. Changes in blood pressure with time and between treatments were assessed by two-way analysis of variance with Scheffe's correction for multiple comparisons.

Results

There was no significant mean difference between home and clinic blood pressures during the home recording period, either in the group as a whole or when normotensives and hypertensives were considered separately (Fig. 1, Table 1). However, there was a positive correlation between mean home and clinic blood pressures during the period of home recording both for systolic (r, 0.74; P<0.001) and diastolic blood pressures (r, 0.66; P <0.001). The differences between home and clinic blood pressure were unrelated to age, level of blood pressure, type of drug therapy, or type of sphygmomanometer.

Table 1
Mean differences between blood pressure recorded at home and in the clinic in all subjects and by hypertensives. A negative difference indicates a lower home blood pressure.
SD = Standard Deviation

	All Subjects (n = 83)		Hypertensives (n = 50)	
	SBP	DBP	SBP	DBP
Mean	−1.4	+1.5	−1.1	+0.79
Range	−49±30	−36±17	−49±30	−23±16
SD	13.9	9.4	15.6	8.2

SBP = Systolic blood pressure
DBP = Diastolic blood pressure

Aneroid sphygmomanometers were tested against a mercury sphygmomanometer at the end of the home recording period and none showed an error in excess of 4 mmHg. There was no change in clinic blood pressure during home recording either in hypertensive or normotensive patients or in the group as a whole (Fig. 2). Similarly, blood pressure variability, measured as the standard deviation of home-recordings during a three week period, was not significantly altered by home recording. When consecutive clinic pressures were compared there was a significant fall with time in systolic (P<0.005) but not diastolic blood pressure (Fig. 3).

Figure 2: Comparison of clinic blood pressure recordings during the period of home-recording and the period of clinic attendance only (n=83).
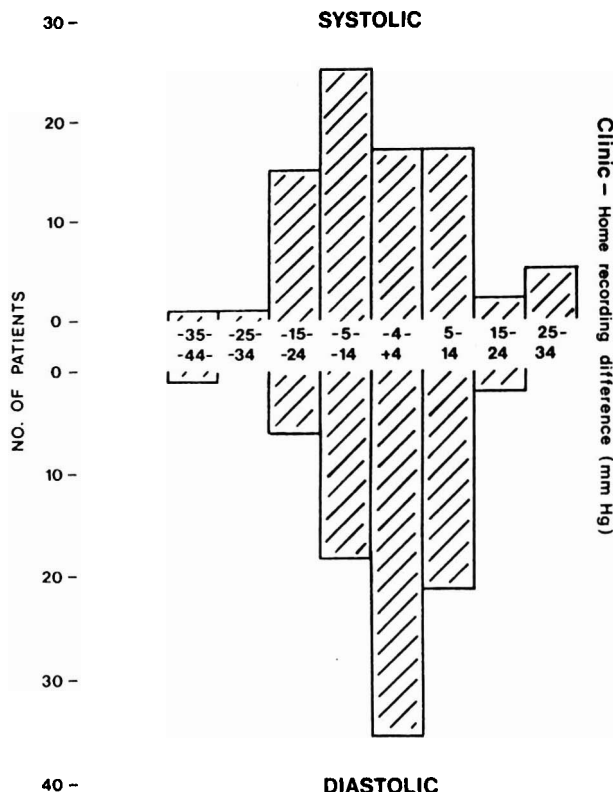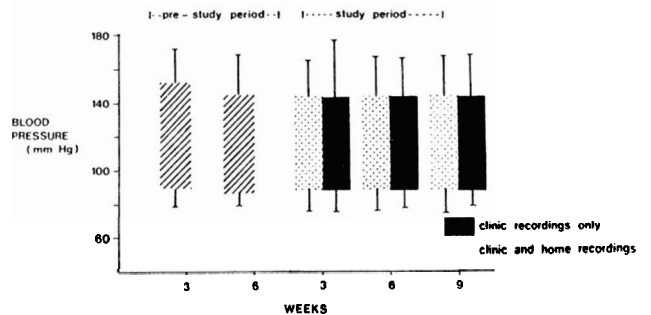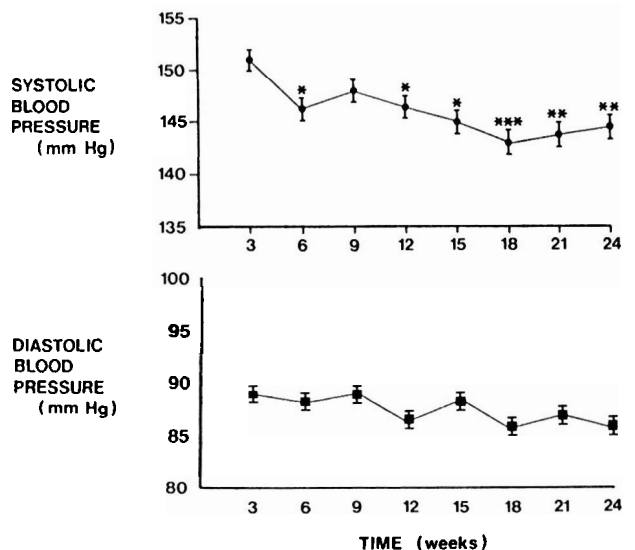

Figure 1: Distribution of differences between the mean of all home-recorded blood pressures and the mean clinic measurements recorded during the home-recording period.

Figure 3: Time-related change in clinic blood pressure in all subjects (n = 83) during the study.

Discussion

The difference observed between home and clinic blood pressure recordings varies widely between studies (Table 2). In most studies home-recorded blood pressure measurements have tended to be less than clinic-recorded blood pressure. Home-clinic differences vary greatly between patients, being greater at higher clinic blood pressures,[5,6] and decreasing with age[6] and duration of clinic attendance.[8] The absence of any mean difference between home and clinic blood pressure in this group may reflect a higher mean age and lower blood pressure compared with patients in previous studies. Furthermore the majority of patients had been attending the clinics for a long period. Another factor of relevance may have been the selection of patients. Bias in patient selection was reduced in this study by entering consecutive eligible patients attending outpatient clinics. Patients were not therefore entered into the study because it was suspected that their home blood pressures were low. Similarily, no attempt was made to select subjects with persistently elevated blood pressure.

This study confirms that patients may be trained to record blood pressure accurately[3,5] even after a brief period of training.[7,12] Furthermore, equal accuracy may be obtained by patients using aneroid and standard mercury sphygmomanometers. This is important as aneroid manometers are easily damaged and are less likely to be accurate than mercury sphygmomanometers during long-term use.[13,14] In addition, servicing of aneroid sphygmomanometers usually necessitates returning the instrument to the manufacturer, while repair of a mercury manometer is relatively simple.[14]

Previous studies have suggested that home-recording of blood pressure by hypertensive patients, both treated and untreated, is associated with a lowering of clinic blood pressure.[9-11] In contrast we failed to demonstrate a fall in blood pressure during the period of home recording in treated or untreated subjects. The reduction in blood pressure noted by Laughlin[9] was most marked in the initial home-recording period and may have reflected the fall in blood pressure which occurs on repeated measurement. Without a crossed-over design this fall in blood pressure cannot be assigned to an effect of home-recording. In our study, blood pressure fell during the study period when consecutive clinic blood pressure measurements were compared. However, comparison of clinic measurements during the period of home-recording with clinic measurements during a control period showed no significant differences. Carnahan[11] and Johnson[10] have shown that blood pressure control is better during home-recording in treated hypertensives, but treatment changes were made as required and may have been influenced by the

Table 2
Comparison of home-recorded and clinic-recorded blood pressures. Data from previous studies.

Study	Sphygmo-manometer	Duration of Home-Recording	Mean Clinic Pressure	Mean Home Pressure	Mean Clinic/Home Difference
Ayman 1940	Mercury	4-94 wks	Not stated	Not stated	18.0/11.4
Julius 1964	Not stated	2 days	129/65	126/71**	3/-6
Julius 1974	Not stated	1 wk	122/73	121/76***	1/-3
			146/88	131/84***	15/4
Raftery 1974	Aneroid	4 wks	180/106	160/101	20/5
Burns Cox 1975	Aneroid	6 mths	Not stated	159/111	0/0
McGrath 1980	Aneroid	10 wks	131/92*	145/100	-14/-8
Laughlin 1980	Aneroid	1 mth	149/96	138/91	11/5
Beckman 1981	Mercury	Not stated	143/75	131/84	12/2
Gould 1982	Aneroid	4 wks	180/106	160/101	20/5
Weilin 1982	Aneroid	1 wk	168/102	165/101	6/1

* London School of Hygiene Sphygmomanometer.
** Normotensives.
*** Borderline Hypertensives.

knowledge that some blood pressure measurements were elevated or that patients were more aware of their level of control. In contrast treatment remained unchanged in our patients during the study.

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