A new approach to blood pressure measurement in the primary care setting

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SUMMARY

In this study, a method of taking one blood pressure reading using a sphygmomanometer was compared with a method of taking multiple successive readings using an automatic device. With multiple readings the blood pressure tended to be lower and fewer patients were classified as hypertensive. Using an automatic blood pressure recording device seems to be a practical way of achieving multiple readings in a busy clinic setting.

Keywords: blood pressure readings; hypertension; primary care development.

Introduction

ACCURATE blood pressure (BP) measurement is important to classify patients correctly as either hypertensive or normotensive and treat accordingly. However, accurate measurement is complicated by the physiological variability of BP.[1] In general, stress and physical exercise increase BP, whereas rest and sleep decrease it. Also, the measurement process itself can be associated with a rise in BP, with repeated readings recording a return to pre-measurement levels.[2] Therefore, latter readings of a series may represent the usual BP better than a single reading.[2]

The practice of taking multiple BP readings is recommended in guidelines[3] but can be time-consuming in the busy primary care setting. Therefore, use of a validated[4] automatic BP measuring device may enable this practice without increasing workload.

In this study, we aimed to compare a method of taking several successive BP readings using an automatic device with the common practice of a single reading being taken by a physician using a sphygmomanometer. These two methods were compared in terms of mean differences in systolic and diastolic BP measurements and the proportion of patients classified as normotensive, mildly hypertensive, and moderately or severely hypertensive.

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Method

The target population consisted of 150 hypertensive patients visiting their family practitioner for a routine blood pressure check. Out of this group, 117 patients (78%) completed three successive measurements. Ages of the patients ranged from 21 to 90 years (mean = 69.6 ±10.8 years); 56% of the patients were female and 44% were male.

A single BP measurement was taken by a doctor or a nurse using a standard mercury sphygmomanometer. After the consultation, a set of up to five consecutive readings was taken using an automatic BP recording device (OMRON HEM-705CP), with two to three minutes between each reading. In both methods of measurement, BP was measured in the sitting position, on the right arm, after a rest period of five minutes.

Normotension was defined as a BP less than 140/90 mmHg, mild hypertension as 140/90 to 159/99 mmHg, and moderate or severe hypertension as greater or equal to 160/100 mmHg,[5] where classification is according to the systolic or diastolic, whichever places the patient in the most hypertensive category.

Statistical analysis

The mean differences between physician and device readings were calculated. To assess the degree of agreement between the results of the two measurement methods we calculated the limits where 95% of the differences will lie according to Bland and Altman.[6] The distribution of BP classification was compared between physician and device measurement using the Sign test.

Results

Mean systolic values ranged from 155.6 to 166.1 mmHg and mean diastolic values from 75.9 to 89.2 mmHg (Table 1). The mean differences in systolic BP between physician and first, second, and third device readings were -4.8 ±19.8 mmHg, 3.7 ±21.4 mmHg, and 5.6 ±19.3 mmHg respectively, and in the diastolic -1.3 ±13.6 mmHg, 0.86 ±16.4 mmHg, and 2.1 ±12.1 mmHg respectively. Measures of agreement were calculated for all differences, resulting in wide limits indicating lack of agreement between the two measurement methods. For example, between the physician and the third device reading the limits ranged from -32.2 to 43.4 mmHg for systolic BP and from -21.6 to 25.8 mmHg for diastolic BP.

The Sign test showed that the distribution of classification according to the second and third device measurements was significantly different from the distribution according to the physician (P = 0.0001 and 0.0005 respectively), with a higher proportion of normotensives and lower proportion of moderate and severely hypertensives.

Discussion

Taking two or three device readings rather than a single sphygmomanometer reading tended to give lower BP measurements and increased the proportion of patients classified as normotensive. Therefore, clinical decision-making based on the automatic device multiple reading method would presumably have resulted in reduced treatment load while remaining practical.

The limitations of this study include a possible selection bias

Table 1. Mean BP of physician and device readings and distribution of BP classification (three measurements completed; n = 117).

	Mean ±SD (mmHg)		Patients (%)			P-value[a]
	Systolic	Diastolic	Normotensive	Mildly hypertensive	Moderate or severe hypertension	
Physician's reading	161.3 ±20.7	87.9 ±9.5	6.8	30.8	62.4	-
Instrument reading						
1	166.1 ±25.5	89.2 ±16.5	11.1	27.4	61.5	0.4
2	157.5 ±25.6	87.0 ±18.7	22.2	28.2	49.6	0.0001
3	155.6 ±22.7	75.9 ±13.5	20.5	29.1	50.4	0.0005

[a]P-value represents the significance of the difference in distributions of physician recordings compared with successive device recordings.

owing to the exclusion of 33 out of 150 patients. Also, since our study population included only known hypertensives results cannot be assumed to apply to a normotensive population.

Results from this study include only three successive measurements. However, we demonstrated a clear trend in our results highlighting the significant effect of multiple rather than single BP measurement. In a future study, it would be interesting to determine the effect of taking a larger series of successive measurements, in particular to determine the point at which the trend of reduction in BP with multiple measurement ceases and to compare results with ambulatory readings taken on the same patients.

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