Comparison of the Blood Pressure Measured by the Doctor with the Self-measurement by the Patient

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Abstract

Background: Optimizing and standardizing the blood pressure measurement method is of paramount importance in reducing the morbidity and mortality of systemic arterial hypertension, a disease directly related to the value of blood pressure
Objective: to compare the values of the arterial pressure measured by the doctor in the office with the AP measured by the patient in a calm environment.

Methods: this cross-sectional study was carried out with secondary data from a cardiology clinic, located in Santa Cruz do Sul, RS, Brazil, which has the standard of self-assessment prior to consultation with the physician, and to correlate these results with ABPM.

Results: after a careful analysis of 332 medical records from non-parametric tests, we noticed that the correlation between the mean systolic and diastolic values measured by the patient and those measured by the physician had a strong positive and significant correlation (SBP: r = 0.703; p ≤0.001 / PAD: r = 0.75, p≤0.001). When correlating the systolic measurements of ABPM with the averages of patient and physician measurements, significant and positive correlations were found, being moderate (r = 0.437, p≤0.001) and weak (r = 0.243; p≤0.001), respectively. As for the diastolic, both were moderate (patient: r = 0.677; p≤0.001; physician: r = 0.499; p≤0.001).

Conclusion: interpreting these results, we can reach the conclusion that, although there is no significant difference between the pressure values, there is a greater correlation between those measured by the patient in a calm environment with the ABPM values when compared with those measured by the physician.

Keywords: Blood pressure; self-measurement; comparison; ABPM.

Introduction

Systemic arterial hypertension (SAH) is an endemic disease with associated high morbidity and mortality. It is estimated that it has a prevalence of approximately 1.4 billion people worldwide, corresponding to 31% of the adult population, with an increase of 7.7% from 2000 to 2010 in low/middle income countries, such as Brazil.[8]

Having an adequate and accurate blood pressure (BP) measurement method is of paramount importance to correctly diagnose and treat patients with SAH, decreasing the chances of complications such as stroke or acute myocardial infarction52. The SPRINT52 study that had in its method the self-measurement of blood pressure from an automatic sphygmomanometer in a calm and alone environment was of great importance to establish pressure targets and guides for physicians to optimize the medications of the patients. However, this method used in the study is not what occurs in practice in most medical consultations.

Moreover, so far, there is no formal recommendation of who should measure the BP or even the environment in which it should be measured. Therefore, to ascertain the methods and ways in which the BP can be reliably measured, either by a physician in the office or by the patient in a calm and alone environment, it is essential to improve the quality of life and treatment of patients with SAH decreasing the morbidity and mortality of this disease.

Methods

In this cross-sectional study, we collected secondary data from the medical records of 332 patients attending the cardiology clinic, Cardioclínica Dr Solon, located in Santa Cruz do Sul, RS, Brazil, from January to March 2018 and who had Performed the self-measurement prior to the consultation. We excluded data from

pregnant patients on dialysis or who did not perform both measurements (three self-measured and two by the physician), remaining 327. The term of commitment to use data was read and agreed with the institution in question for its release and this research was approved by the Research Ethics Committee.

The self-measurement method of the aforementioned clinic is done by means of a trained attendant who instructs the patients, who are waiting for the consultation, to move to a separate room and to remain seated alone for five minutes after being placed the Automatic electronic digital sphygmomanometer of the brand Omron Hem 742 Int. on his right arm, and to measure blood pressure three times with a 1-minute interval between them, following the Guidelines of the American Heart Association and the Brazilian Society of Cardiology. During the medical consultation at the same day, the pressures were measured twice with an interval of 30 seconds also seated, with a manual digital sphygmomanometer of the brand Heine-Gamma G7, by the physician, in the right arm, using the Guidelines of the American Heart Association and the Brazilian Society of Cardiology. Some of these patients had also done an Ambulatory Blood Pressure Measurement (ABPM) in this period, data that were also collected for analysis.

Data were analyzed in statistical software (SPSS, version 18.0). In descriptive analyses, numerical (quantitative) variables were demonstrated as mean and standard deviation (SD) or median and interquartile range (P25-P75) and categorical (qualitative) as number of individuals (N) and percentage (%). The Kolmogorov-Smirnov normality test was performed for all blood pressure measurements used in this study, indicating a breach of the normality assumption. In this sense, Spearman's rank test and Wilcoxon's test were used for correlation analysis for comparisons between blood pressure values.

Results

Of the 332 patients, only 327 did the three self-measurements and the two measured by the physician. Regarding the data analysis of these patients, we have a distribution of 49.84% (163) Women, 11.31% (37) diabetics, 5.81% (19) Smokers and 56.26% (184) who used antihypertensive medication. The mean age was 55 years, with a minimum of 12 and a maximum of 98 years.

When analyzing the pressure values self-measured by the patients, the total mean was 134/79 mmHg, with a standard deviation of 17/11. The total mean of blood pressure measured by the physician was at 134/76 mmHg, with a standard deviation of 17/11. When analyzing the ABPM values, the mean total pressures was 131/84 mmHg, with a standard deviation of 13/12; awake pressure was 135/88 mmHg, with standard deviation of 13/12; and nocturnal was 120/74 mmHg, with a standard deviation of 14/12 (table 1).

When correlating by the Spearmann test (non-parametric test) (Figure 1) the mean systolic values measured by the patient (3 measurements) with the averages of the systolic values measured by the physician (2 measurements) gave a strong positive correlation and significant ($r = 0,703$; $p \leq 0.001$). Moreover, when comparing the medians of these measures with a non-parametric test for Wilcoxon-dependent samples, it was not significant, agreeing with the previous correlation, i.e., that the mean values measured by the patient compared with those measured by the Doctor were very similar: 134 mmhg (88-198) vs. 134 mmhg (93-214) respectively, $p = 0,681$.

Similarly to the diastolic, when correlating by the Spearmann test (non-parametric test) (Figure 2) the mean systolic values measured by the patient (3 measurements) with the averages of the systolic values measured by the physician (2 measurements) gave a positive and significant strong correlation ($r = 0.75$; $p \leq 0.001$).

Correlating the systolic measurements of the ABPM with the means of the measurements of the patient and the physician, by the Spearman rank test, significant and positive correlations were found, being moderate $r = 0,437$ ($p \leq 0.001$) and weak 0.243 ($P = 0,046$), respectively. For diastolic, same interpretation: ABPM vs. patient $R = 0,677$ ($p \leq 0.001$), and with physician $R = 0,499$ ($p \leq 0.001$).

When we analyzed the values separately, we noticed that 286 patients (87.46%) showed a difference of at least 4 mmHg, whether systolic or diastolic between the self-measured values and the physician's. Of these, 113 (34.55%) had a mean systolic pressure measured by the physician higher, and 124 (37.92%) had the patient's measurement higher. If we analyze only differences greater than or equal to 10 mmHg, the proportion remains very similar (19.26% higher by the physician, and 18.04% higher by the patient) (table 2).

However, for diastolic values, 162 patients (49.54%) had a self-measured diastolic mean of 4 mmhg or more than that of the physician, and 20.18% of them had a difference of 10 mmhg or more. On the other hand, only 55 patients (16.81%) obtained a diastolic mean measured by the physician of 4 mmhg or more than that of the patient, and 5.50% of 10 mmhg or more (table 2).

Discussion

What we can conclude with the analysis of these secondary data is that, although there is no significant difference between the two methods of blood pressure measurement, there is a greater correlation between the patient's measurement in a calm environment and the ABPM. Therefore, knowing, with the current available literature, that ABPM has a more reliable expression of the patient's actual blood pressure, we should consider the need to standardizing the method used by physicians to measure BP.

Some studies have attempted to ascertain whether there is significant difference between self-measurement in a calm environment by the patient and manual measurement by the physician, and have reached the same conclusion that there is no difference[1,8,9,18,31,38]. An example of this was the study conducted in Sweden by al-Karkhi et al, in which a difference of 1,1 mmHg was demonstrated between the averages of the values obtained by the physician by the traditional manual method, and that obtained by the patient with semi-automatic apparatus in calm environment[1]. The study by Bauer F et al, conducted in Germany, also showed no statistically significant difference[8].

What has been investigated in the current literature is the difference between the manual measurement of the physician when compared with HBPM and ABPM, being greater than the office, showing that there is difference in the values when changing the location in which this measurement is performed, as already explained in the study conducted by Armstrong D et al in Canada[5]. But it is not useful to investigate the most accurate method of assessing BP, when physicians do not apply in practice, a subject that was approached in Japan by Asai Y et al, who, based on questionnaires, investigated that most physicians use various techniques for routine measurement of BP, but none faithfully followed the guidelines[6]. However, this result was rebutted by a study conducted in Finland[51] and Canada[22], which demonstrated a standardization of the method, which reveals a great variability among countries.

The SPRINT study, which evaluated 9361 high-risk patients to determine the pressure target, used as a basis for BP monitoring self-measurement in the office in a calm environment[54]. What is not known, however, is how much this is applicable in practice, since the vast majority of the offices still routinely use the traditional method with manual sphygmomanometer. It would be important to determine whether there would be any difference between the two methods, since you can completely change the treatment flowchart. The fact that the mean BP values obtained by self-measurement correlate better with the total mean of the ABPM can speak in favor of reviewing the routine of the BP measurement by the physician, which has already been cited in the Canadian guidelines, recommending to physicians to use the automatic sphygmomanometer for screening and monitoring of BP[16,22,40].

Conclusion

When analyzing the data obtained from the medical records, we can conclude that there is no significant difference between the patient's self-measurement in a calm environment and the physician's measurement. However, we cannot fail to notice a stronger correlation of the values obtained by the patients with the mean pressures on the ABPM.

However, further studies are needed to determine the most reliable method with the patient's actual pressure so that we can treat them appropriately within each profile.

Conflicts of Interest

There are no conflicts of interest.

Tables

Table 1

Table 1 - Variables of pressure values by different methods

Methods	N° Patients	Mean	ndard deviati	Minimum	Maximum	Percentile 25	Percentile 75
yst. Self-measure	327	134	17,18	88	198	121	143
iast. Self-measure	327	79	11,76	47	117	71	86
Syst. Physician	327	134	17,78	93	214	122	144
Diast. Physician	327	76	11,45	48	115	67	84
Syst. ABPM	69	131	13,35	106	172	121	141
Diast. ABPM	69	84	12,11	61	111	75	94

Syst. Self-measured: mean systolic pressure by self-measurement; Diast. Self-measured: mean diastolic pressure by self-measured; Syst. Physician: mean systolic pressure measured by the physician; Diast. Physician: mean diastolic pressure measured by the physician; Syst. ABPM: mean systolic pressure by ABPM; Diast. ABPM: mean diastolic pressure by ABPM.

Table 2

Table 2 - Difference between means of BP by different methods				
(Syst. Self-measured) - (Syst. Physician)	≤-10	≤-4	≥4	≥10
Total	63	113	124	59
%	19,26%	34,55%	37,92%	18,04%
(Diast. Self-measured) - (Diast. Physician)	≤-10	≤-4	≥4	≥10
Total	18	55	162	66
%	5,50%	16,81%	49,54%	20,18%

Syst. Self-measured: mean systolic pressure by self-measurement; Diast. Self-measured: mean diastolic pressure by self-measured; Syst. Physician: mean systolic pressure measured by the physician; Diast. Physician: mean diastolic pressure measured by the physician.

Figures

Figure 1

Figure 1: Spearmann's dots showing correlation between systolic means measured by the patient with those measured by the physician

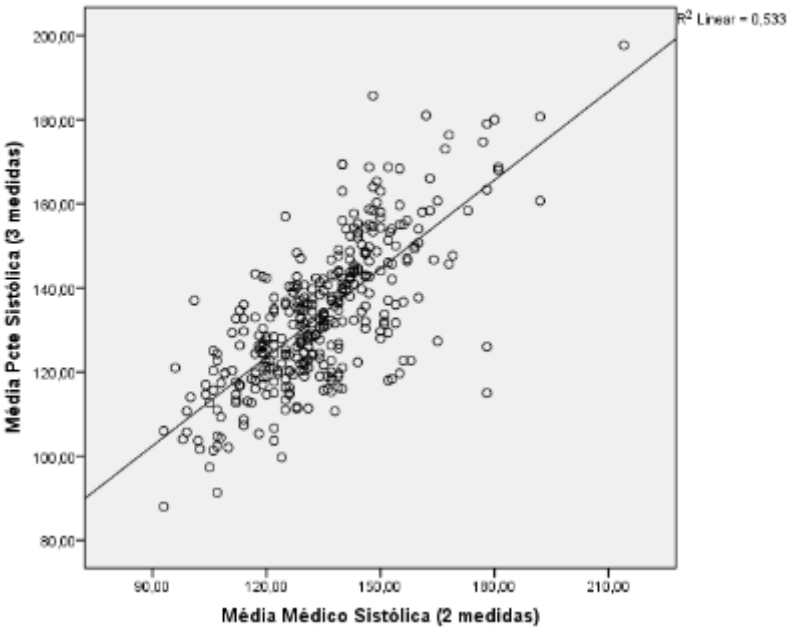
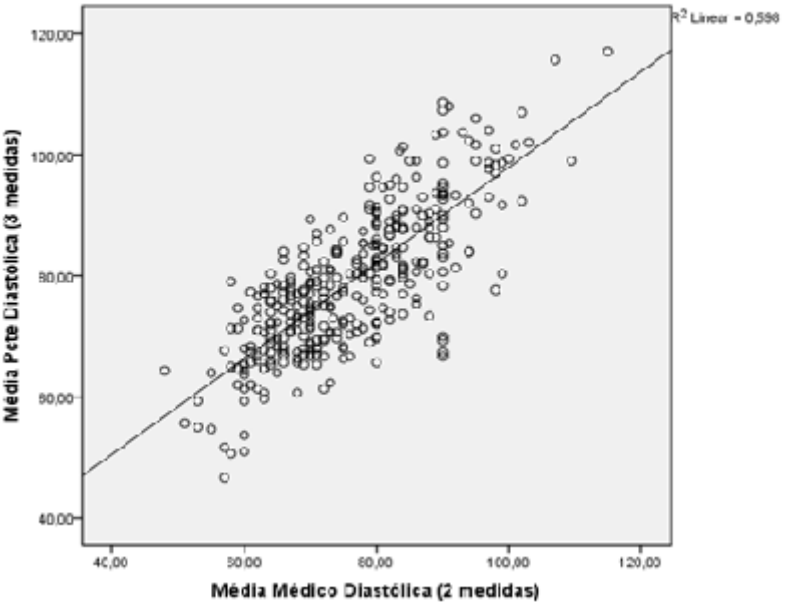


Figure 2

Figure 2: Spearmann's dots showing correlation between diastolic means measured by the patient with those measured by the physician



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