Optimizing the Treatment of Hypertension in the Primary Care Setting

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Summary

Objective: **To assess the result of the care provided by an interdisciplinary team on the control of hypertension.**

Methods: **In a Health Unit, 88 patients were treated by an interdisciplinary team for 12 months. Visits to the physician or nurse occurred every one to three months, and to the nutritionist whenever necessary. Educational lectures were delivered regularly. Total cholesterol and fasting plasma glucose levels were determined at baseline and at 12 months. Clinical and laboratory data were analyzed and blood pressure was compared at baseline and at six and 12 months, and total cholesterol and plasma glucose were compared at baseline and at 12 months.**

Results: **Females accounted for 79.41% of the sample and the mean age was 58±9.90 years. Median blood pressure (BP) was 166.00/96.5mmHg at baseline, 146.75/85.25mmHg at 6 months (p<0,000) and 134.00/80.00mmHg at 12 months (p<0.000). The rate of BP≤140/90mmHg increased from 10.23% to 48.81% (p<0.000). Median total cholesterol decreased from 217mg/dl to 194.00mg/dl (p<0.004) and median blood glucose from 101mg/dl to 95mg/dl (NS). At baseline, 50% of the patients received two antihypertensive drugs, 25% received three, and 5.68% received four, whereas at 12 months these percentages were 21.18%, 29.41% and 32.94%, respectively.**

Conclusion: **The care provided by an interdisciplinary team may significantly improve the control of hypertension and of associated cardiovascular risk factors.**

Key words: **Hypertension, treatment, interdisciplinary team.**

Introduction

Studies show higher morbidity and mortality from cardiovascular events in hypertensive patients[1-3]. The JNC-VII[4] mentions that the decrease in BP to 120/80mmHg reduces the incidence of heart failure by up to 50%, of stroke by between 35% and 40%, and of coronary artery disease by between 20% and 25%, with reduction of the overall mortality. Starting from 115/75mmHg, every 20mmHg increase in the systolic pressure and 10mmHg increase in the diastolic pressure doubles the risk of cardiovascular events. Treating patients in stage I hypertension (140-159/90-99mmHg) and reducing the systolic pressure by 12mmHg for 10 years is estimated to save one life for every 11 patients treated[5].

Epidemiological data show a high prevalence of hypertension (20% to 40% in the adult population), high rates of unawareness of the condition (50%), and unsatisfactory control rates (30% to 56%)[6-14]. In the city of Salvador, Brazil, the control rate is of approximately 35%[15].

The poor control is related to inadequate compliance to treatment, which depends on several factors: age, gender, ethnics, socioeconomic level, lifestyle, cultural aspects, management of the health care system, and the health team's skills and integration. Well-structured Interdisciplinary teams lead to an increase in compliance to treatment and, consequently, to better control rates[16].

The Ministry of Health has been concerned about the magnitude of this problem for its human and economic aspects. CVDs account for 14% of the total hospitalizations (representing 16.2% of the Health budget[5]) and 25% of early retirements[17], in addition to being the major cause of death in Brazil (27.4%), accounting for 65% of the total deaths between 30 and 69 years of age[18].

A change in this scenario requires a governmental policy that includes efficient primary health care models by means of better management of the basic health care network comprised of Basic Health Units (BHU), and changes in the health care model able to optimize the human and logistic

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resources available. Financial investment on poorly organized and inefficient structures encourages the vicious cycle of health care bankruptcy with high costs and impairment of the quality of the care provided by the secondary health care network.

The objective of this study was to assess the impact of the organization of an integrated interdisciplinary model on the control of hypertension and associated risk factors.

Methods

Study design – Prospective intervention study with historical controls conducted in the outpatient service of the *Sete de Abril* Health Center (SAHC) in the suburb of Salvador, with a population of 18879 inhabitants[19] comprised of low-social-class individuals.

Patient selection – Between June, 2003 and October, 2003, 88 hypertensive patients older than 18 years of age, who were being treated by the author for more than a year with at least two visits in the past year, and who gave their informed consent were selected.

Patient assessment – The diagnosis of hypertension was based on BP≥140/90mmHg or on the regular use of antihypertensive medications[5]. High blood pressure control at baseline and during follow-up was assessed by the author by means of a duly calibrated BD aneroid sphygmomanometer with the cuff involving at least 80% of the arm, with the patient resting in the sitting position for at least five minutes, and his arm, preferably the right one, supported at the level of the heart. Systolic pressure was measured at the first of two or more heart sounds (Korotkoff phase I), and the diastolic pressure when the sounds were muffled (Korotkoff phase IV) or disappeared (Korotkoff phase V). The final value recorded was the arithmetic mean of two readings, with a one-minute interval. The patient was informed, both verbally and in writing, on the value found and the desirable value.

Laboratory assessment consisted of blood collection after a 12-hour fast for blood glucose, total cholesterol (TC), HDL cholesterol (HDL-C), LDL cholesterol (LDL-C), triglycerides (TG), creatinine, and highly sensitive TSH (for dyslipidemic, obese, and diabetic patients, and those with manifestations suggestive of hypothyroidism), and urinalysis. Except for TSH, biochemical tests were repeated at 6 and 12 months. Values of the lipid profile were interpreted according to the III Brazilian Guidelines on Dyslipidemias[20], and those of blood glucose, according to recommendations of the AHA/NIH[21]. Of these laboratory data, only post-intervention progression of TC, blood glucose and creatinine were studied.

Resting 12-lead ECG and chest radiograph in the posteroanterior view were also performed, and occasionally repeated if clinically indicated.

Reorganization of the health care structure – The interdisciplinary team was comprised of health professionals working at the BHU, but who worked without proper interaction and definition of objectives. It included a cardiologist (the author), a nurse, a nutritionist, a social assistant and a nursing technician. The respective assignments were then defined as well as the therapeutic goals for the control of blood pressure and of other cardiovascular risk factors, as a common team objective.

The physician was responsible for the patients' clinical assessment and therapeutic advice, with emphasis on reaching the goals of blood pressure control through gradual intensification of the pharmacological treatment, and programming of permanent educational activities, in collaboration with the team, aiming at providing information on the disease and on the importance and benefits of lifestyle changes, and of compliance to the pharmacological treatment.

The nurse was responsible for monthly visits to monitor blood pressure; for keeping the patients' medication under control; for instructing and advising on the pharmacological and non-pharmacological treatment; for ordering tests previously defined by the physician; for referring patients whose blood pressure was difficult to control or those with target-organ lesions to monthly medical visits, and the remaining patients to visits every three months; for organizing monthly interdisciplinary lectures; and for coordinating activities facilitating compliance. As for the latter, the patients were encouraged not to miss visits and lectures through reminders and awareness of the importance of their participation. Insurmountable personal problems would be supported by a social assistant for a suitable solution. The nursing technician, under the supervision and training of a nurse, was responsible for supporting the team's operational activities.

The nutritionist was responsible for visits every two months, when requested, for weight control and assessment of the nutritional care, and participation in monthly interdisciplinary educational activities.

Antihypertensive medication – Pharmacological treatment was based on the medications provided by the SAHC: Alpha-methyldopa (250mg), Captopril (25mg), Clonidine (0,100mg), Hydrochlorothiazide (25mg) (HCTZ), Nifedipine retard (20mg) and Propranolol (40mg).

Statistical analysis - Anthropometric, clinical, laboratory and health care data were expressed as mean and standard deviation, and median. The comparison of blood pressure values at baseline and at six and 12 months, and of TC and blood glucose at baseline, and at six and 12 months of intervention used median values with the Wilcoxon test, because of skewed data. Likewise, the number of visits to the physician, the nurse, and the nutritionist was compared between the 2003 base-year and 2004, the year when the study was conducted. Percentage values were compared using the McNemar test.

Multiple median regression was used for comparison of systolic and diastolic pressures at baseline, at six and 12 months of study, where model parameters were estimated in robustness conditions from independent variables previously selected by biologic plausibility criteria (differential before versus after for all). For all tests, the exact p values were calculated. Data were organized in a database (Excel), in a personal computer with a Windows 98 operating system. STATA version 7.0 (College Station, Texas) was used for the statistical analysis.

This study was approved by the Research Ethics Committee of the Foundation for the Development of Sciences of Bahia.

Results

Sample and baseline data - Anthropometric, educational, clinical, laboratory and health care data obtained at baseline from the 88 hypertensive patients selected are shown in Table 1. The majority of the patients were females, 69 (78.41%), with mean age of 58.03±9.9 years; 54 (65.06%) were self-declared to be non-white, and 76 (92.69%) had attended elementary school at maximum.

High mean and median levels were observed: 158.60±25.98/94.33±12.50mmHg and 160/90mmHg for blood pressure; 220.80±45.05mg/dl and 217mg/dl for total cholesterol; and 112.10 ± 41.98mg/dl and 101mg/dl for fasting plasma glucose, respectively. Serum creatinine levels were normal. The analysis of TC and blood glucose levels shows high TC (≥200mg/dl) in 54 (71.60%) patients, with high risk values (≥240mg/dl) in 21 (25.92%), and high fasting plasma glucose in 38 (50.72%) patients, with values compatible with diabetes mellitus (≥126mg/dl) in 12 (17.39%) patients. On the other hand, mean and median values of visits to the physician, nurse, and nutritionist in the 2003 base-year were low, with mean values of 2.64±0.90, 4.43±2.88 and 1.72±3.13, and median values of 2, 5 and 0, respectively.

Progression of health care data – Throughout the year of 2004, the median of visits to the physician, nurse, and nutritionist increased from two to seven, from five to nine, and from zero to two, respectively, thus representing an increase of 3.5, 1.8, and 2 times in relation to the 2003 base-year (Table 2). Likewise, the percentage of compliance, as informed in terms of dose and regularity in the use of medications and compliance to low-salt diet, also increased from 73.56% to 85.06% in 6 months, and to 91.57% in 12 months ($p<0.0000$).

Progression of clinical and laboratory data – The median blood pressure decreased from 166.00/96.00mmHg to 146.75/85.25mmHg ($p<0.000$) after 6 months, and to 134.00/80.00mmHg ($p<0.000$) after 12 months (Table 2). Fifty percent of the sample presented a reduction by 28mmHg in systolic pressure and by 14mmHg in diastolic pressure, and 75% presented a reduction by 10mmHg in both systolic and diastolic pressures. The percentage of controlled BP (<140/90mmHg) increased from 10% to 48.81% in 12 months, a 4.77-fold increase ($p<0.0000$).

Pharmacological treatment – At baseline, 50.00% of the patients used two antihypertensive drugs, 25.00% used three, and 5.68% used four. At 12 months, these percentages were 21.18%, 29.41% and 32.94%, respectively, thus representing an increase by 17.64% and 480% in the use of three and four antihypertensive drugs, respectively (Table 3). At 6 months, the percentages of antihypertensive drugs per patient were already very close to those obtained at 12 months, as shown in Table 3.

HCTZ and Captopril were the most frequently used antihypertensive drugs at baseline, 85.22% and 69.32%, respectively, followed by Nifedipine R and Clonidine, both with 31.82%, as shown in Table 4. At 12 months, HCTZ ranked first with 92.77% of use, followed, however, by Nifedipine R with 73.17%, Captopril (67.11%), and Clonidine (52.94%).

Discussion

The study population is characterized by a predominance of females, which has also been observed in other local studies on the prevalence of hypertension[22]. In the present sample, the methodology does not allow the conclusion that this finding results, for instance, from the fact that these women did not work outside their homes, and therefore could attend the neighboring ambulatory more often, or from being more interested in their own health.

Age and high levels of blood pressure, TC, and fasting plasma glucose characterize a population at an increased cardiovascular risk, with a ≥20% probability of a fatal or non-fatal cardiovascular event in the next 10 years[21]. Despite this, the low rate of blood pressure control (10.23%) and the high prevalences of hypercholesterolemia (71.60%) and high blood glucose (50.72%) call the attention, in spite of the follow-up of at least one year in the BHU, thus characterizing the inefficiency of this health care model. The number of annual visits lower than three to the physician, and lower than four to the nurse - the latter only to obtain medication, certainly contributed to this situation. Additionally, we should point out that physicians frequently disregard the goals recommended, and accept levels of blood pressure that are still high, a tendency that had already been reported in the international literature[23].

The effects of the organization of the interdisciplinary team on this situation may be evaluated by the progression of blood pressure, TC and blood glucose levels throughout the one-year period that followed the health care restructuring. The beneficial effect on BP was significant, and was already observed at 6 months of intervention, with SBP only mildly elevated, and BP controlled by the end of 12 months of intervention. Likewise, it is worth pointing out that the blood pressure control rate increased from 10.23% to 48.81%. Although this is not yet the desirable percentage, it is equivalent to the best international rates, and surpasses the 30% rate found in the city of Salvador[15]. TC reduction was also significant throughout the study, with a two-fold increase in the percentage of normal TC, going from 27.27% to 54.55%. This significant increase in the percentage of normal TC resulted from a reduction from 17 to 9 (47.06%) patients in the range of high risk cholesterol (≥240mg/dl) and from 31 to 21 (32.26%) patients in the intermediate risk range [20]. As regards fasting plasma glucose, despite the modest 12% increase in the percentage of normal values (<100mg/dl)[21], the median dropped to 95mg/dl, thus showing that, if more specific measures for its control had been taken, certainly the results could have been similar to those of BP and TC. These measures should have included an aerobic exercise program, advice for lower calorie intake, and, if indicated, pharmacological treatment.

These results were associated with changes in the philosophy of the health care provided to hypertensive patients, with integration of the efforts of health professionals, with emphasis, in this case, to the physician-nurse pair. The participation of the nutritionist, albeit important, was irregular due to administrative problems.

Health care reorganization was centered on a greater

		Median (minimum-maximum)
Gender n (%)		
Female	69 (78.41)	
Male	19 (21.59)	
Age (mean ±SD)	58.03±9.90	57.00 (38.00-86.00)
Self-declared ethnics n (%)		
White	29 (34.94)	
Brown	32 (38.55)	
Black	22 (26.51)	
Blood pressure (mean ±SD)		
SBP(mmHg)	158.60±9.90	160.00(115.00-250.00)
DBP(mmHg)	94.33±12.50	90.00 (80.00-140.00)
Education n (%)		
Illiterate	12 (14.63)	
Literate	10 (12.20)	
Incomplete elementary	48 (58.54)	
Complete elementary	6 (7.32)	
Complete secondary	4 (4.88)	
Laboratory data (mean ±SD)		
Total cholesterol (mg/dl)	220.80±45.05	217.00 (109.00-346.00)
Blood Glucose (mg/dl)	112.10±41.98	101.00 (69.00-280.00)
Creatinine (mg/dl)	0.87±0.29	0.80 (0.40-2.40)
Categorized total cholesterol (mg/dl) n (%)		
Col. Total < 200	23 (28.40)	
200 ≤ Col. Total < 240	37 (45.68)	
Col. Total ≥ 240	21 (25.92)	
Categorized blood glucose (mg/dl) n (%)		
Blood Glucose < 100	34 (49.28)	
100 ≤ Blood Glucose < 126	26 (33.33)	
Blood Glucose ≥ 126	12 (17.39)	
Visits (mean ±SD)		
Physician	2.64±0.90	2.00 (1.00-5.00)
Nurse	4.43±2.88	5.00 (0.00-10.00)
Nutritionist	1.72±3.13	0.00 (0.00-11.00)

Table 1 - Anthropometric. educational. laboratory and health care data of the 88 hypertensive patients followed up in a Basic Health Unit in the city of Salvador. State of Bahia. Brazil. at baseline (2003 base-year)

encouragement for the goal of BP control, on the optimization of the nurses' role, and on patient's education through group meetings. Nurses assumed an effective role in monitoring BP control, by measuring BP and checking the regularity of medication use, and referring patients to medical visits whenever dose adjustment or any additional clinical evaluation was necessary. This policy was translated into an increase of medical visits/year from two to seven, and of nursing visits from five to nine.

The strategy for an adequate pharmacological treatment of hypertension is reflected in the progressive combination of the antihypertensive medications supplied by BHUs. We verified that the results obtained were mainly related to the use of two, three and four medications, in a preferential combination of HCTZ, Nifedipine R, and Captopril, with predominance of patients using three (29.41%) and four (32.94%) medications (Table 3). This aspect of the study shows the need for more than one medication for the desirable control of hypertension, a fact that has already been well documented in the literature, and warned by the guidelines[5]. However, the use of three and even of five classes of medications, although the latter by only

	Baseline	6 months	12 months
Medical visits/ year†	2	-	7
Visits to nurse/ year†	5	-	9
Visits to nutritionist/year†	0	-	2
SBP (mmHg) ‡	166.00	146.75	134.00
DBP (mmHg) ‡	96.00	85.25	80.00
Total Cholesterol §	217.00	214.00	194.00
Blood Glucose ††	101.00	106.00	95.00
Creatinine †	0.80	0.90	1.00

** Values expressed as median. † $p < 0.0000$ between baseline and 12 months. ‡ $p < 0.0000$ between baseline, 6 and 12 months. § $p < 0.0004$ between baseline and 12 months and $p < 0.0089$ between 6 and 12 months. †† not statistically significant.*

Table 2 - Progression of health care, clinical and laboratory data* during the 12-month interdisciplinary care for the treatment of 88 hypertensive patients in a BHU in the city of Salvador, State of Bahia, Brazil (2004 base-year)

Medicamentos: n (%)				
n	Baseline	6 months	12 months	Δ(%) *
Zero	3 (3.41)	0	1 (1.18)	↑65.40
One	8 (9.09)	2 (2.30)	3 (3.53)	↑61.17
Two	44 (50.00)	21 (24.13)	18(21.18)	↑57.64
Three	22 (25.00)	26 (29.89)	25 (29.41)	↑17.64
Four	5 (5.68)	26 (29.89)	28 (32.94)	↑480.00
Five	6 (6.82)	12 (13.79)	10 (11.76)	↑72.43

** Percentage variation throughout the 12 months.*

Table 3 - Number of antihypertensive medications used at three study time points (2004 base-year)

a small number of patients (10/11.75%), should be considered because of the costs and inconvenience of simultaneous use of so many pills, which is a possible cause of noncompliance to treatment. Nevertheless, this type of inconvenience should not be an obstacle to achieving the goal of pressure control with the use of as many doses and medications as necessary. In these cases, the fixed combination of drugs, such as ACE inhibitors with calcium channel blockers or each one of these combined with HCTZ, might be a useful alternative. Also in relation to the pharmacological treatment of hypertension, we should point out that the results of this study were obtained with the antihypertensive drugs standardized by the Ministry of Health, which reveals the efficacy of these medications, if properly managed.

Finally, it is worth discussing the reductions observed in TC and fasting plasma glucose levels, which are two of the major factors for cardiovascular diseases. Although no specific measure was taken in relation to the control of these factors, the educational process that resulted from the group meetings and the closer surveillance in relation to the treatment of hypertension probably influenced these results. This shows the importance of the organization of the health care provided to hypertensive patients, which should include, in addition to blood pressure control, the control of other cardiovascular risk factors frequently associated, thus favoring the reduction of cardiovascular complications, especially the atherosclerotic disease.

The high partial BMI values, which were not presented because of their low number relative to the sample, and the observation of the phenotype of these patients suggest a high frequency of overweight/obesity, thus leading to the supposition of a high prevalence of metabolic syndrome, a condition that considerably increases the CVD risk[21]. The lack of a systematic weight, height and waist circumference measurement that could enable the assessment of these variables and their changes throughout the study represents a limitation of this trial, not justified by the absence of the nutritionist in the team for a long time. These measurements

	n (%)				
	HCTZ	ACEI	CCB	BB	S
Baseline					
n=88	75(85.22)	61(69.32)	28(31.82)	19(21.59)	28(31.82)
6 months					
n=87	83(95.40)	63(72.47)	65(74.71)	31(35.63)	44(50.57)
12 months					
n=85	77(92.77)	51(67.11)	60(63.17)	27(32.14)	45(52.94)
Δ(%) **	+8.85	- 3.01	+129.94	+48.86	+66.37

**HCTZ- hydrochlorothiazide; ACEI- angiotensin-converting enzyme inhibitor; CCB- calcium channel blocker; BB- beta-blocker; S- central sympatholytic agent; ** Percentage variation throughout the 12 months. HCTZ: $P < 0.0027$ in the variation of use between baseline and middle of the study. ACEI; Lack of statistical significance in the comparison of variation of use between the three study time points. CCB: $P < 0.0000$ in the variation of use between baseline, 6 and 12 months. BB: $P < 0.0005$ in the variation of use between baseline and 6 months, and $P < 0,0114$ in the variation of use between baseline and 12 months. S: $P < 0.0000$ in the variation of use between baseline, 6 and 12 months.*

Table 4 - Number and percentage of antihypertensive drugs* used during the study (2004 base-year)

should be part of the follow-up routine of these patients and could have been taken by a duly trained nurse technician.

Despite this, our results show that the process of organization of the health care provided to hypertensive patients, even with the current limitations of BHUs, may bring significant improvement in the control of hypertension, with its highly positive individual and collective consequences. In particular, it is worth pointing out three useful aspects for the reality of the Brazilian BHUs, especially in poorer regions. The first aspect is related to the integration of physicians and nurses, the basic nucleus of an interdisciplinary team, because of the complementary skills of these two health professionals. The second is related to the need for a higher number of follow-up visits to the physician and the nurse, with predominance of visits to this latter, a factor that is certainly important to increase compliance, even considering well-controlled patients who could visit the nurse every three months and the physician every six months. The third aspect is related to the proper combination of the pharmacological resources available, in opposition to the maxim that monotherapy is the current objective of the pharmacological treatment. Thus, the target should be to enlarge and integrate interdisciplinary teams, with well defined and feasible therapeutic goals, so that better results in the control of hypertension and other risk factors, which are frequently present, could be achieved.

Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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