ORIGINAL ARTICLE

MAPEC-Salta Project: A New Care Model for Hypertensive Patients in Primary Health Care in the City of Salta, Argentina

Proyecto MAPEC-Salta: una nueva modalidad de atención para pacientes hipertensos en el primer nivel de atención de la ciudad de Salta, Argentina

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ABSTRACT

Background: Hypertension (HT) is the first cause of worldwide cardiovascular morbidity and mortality. However, it is often a poorly controlled disease, mainly because health care systems are oriented to the attention of acute diseases. The Argentine Ministry of Health proposed a new model for the care of hypertensive patients called MAPEC, based on the Chronic Care Model.
Objective: The aim of this study was to evaluate the impact of MAPEC implementation to improve blood pressure (BP) control, changes in lifestyle, disease knowledge and treatment adherence in hypertensive patients treated in three primary health care centers of the City of Salta, Argentina.
Methods: Blood pressure was measured with a digital blood pressure monitor and the Batalla and Morisky-Green-Levine tests were used to evaluate disease knowledge and adherence to treatment, respectively.
Results: The study included 232 patients. After model implementation, significant differences ($p<0.0001$) were found in blood pressure control, disease understanding, treatment adherence and changes in hygienic-dietary measures. There was a decrease in mean BP with a reduction of 12.97 (95% CI: 9.52-16.42) mm Hg and 6.93 (95% CI: 4.70-9.16) mm Hg in systolic and diastolic BP, respectively.
Conclusions: There was evident improvement in the analyzed health parameters after MAPEC implementation. This model can be easily adapted to primary health care centers at a low cost. In addition, it agrees with the 25×25 WHO targets to reduce 25% cardiovascular premature deaths by 2025.

Key words: Hypertension - Primary Health Care - Patient Care Management - Health Planning - Chronic Care Model.

RESUMEN

Introducción: La hipertensión arterial (HTA) es la primera causa de morbimortalidad cardiovascular. A menudo es una enfermedad mal controlada porque los sistemas de salud están más orientados a atender enfermedades agudas. El Ministerio de Salud de Argentina propuso un nuevo modelo de atención para pacientes hipertensos conocido como MAPEC, basado en el Modelo de Cuidados Crónicos
Objetivo: Evaluar el impacto de la implementación del MAPEC en el control de la presión arterial (PA), el cuidado de las medidas higiénico-dietéticas, el conocimiento de la enfermedad y la adherencia al tratamiento en pacientes hipertensos asistidos en tres centros de atención primaria de la ciudad de Salta, Argentina.
Material y Métodos: Se midió la PA con tensiómetro digital automático; se evaluó el conocimiento de la HTA y la adherencia al tratamiento con los test de Batalla y Morisky-Green-Levine, respectivamente.
Resultados: Se estudiaron 232 pacientes. Hubo diferencias significativas ($p <0,0001$) luego de la intervención en el control de la PA, el conocimiento de la enfermedad, la adherencia al tratamiento y las medidas higiénico-dietéticas. También en los promedios de PA, con una disminución de 12,97 (IC95: 9,52-16,42) mmHg en la presión sistólica y de 6,93 (IC95: 4,70-9,16) mmHg en la presión diastólica.
Conclusiones: Fue evidente la mejoría en los parámetros de salud analizados en los pacientes con la implementación del MAPEC. Este modelo es de fácil aplicación y bajo costo. Además, está en consonancia con los objetivos 25x25 de la OMS, mediante los que se busca una reducción del 25% de las muertes prematuras por enfermedades cardiovasculares hacia el año 2025.

Palabras clave: Hipertensión - Atención Primaria de Salud - Manejo de Atención al Paciente - Planificación de salud - Modelo de Cuidados Crónicos

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Abbreviations

BP	Blood pressure	**ISH**	International Society of Hypertension
CCM	Chronic Care Model	**MAPEC**	Model for the Care of People with Chronic Diseases
CNCD	Chronic non-communicable diseases	**PAHO**	Pan American Health Organization
CPG	Clinical practice guidelines	**PHCC**	Primary health care centers
DPB	Diastolic blood pressure	**SBP**	Systolic blood pressure
GCR	Global cardiovascular risk	**WHO**	World Health Organization
HT	Hypertension		

INTRODUCTION

Hypertension (HT) is the world's leading cause of morbidity and mortality (1); however, it is usually a poorly controlled disease. The PURE study (2), a population-based study in urban and rural communities in 17 countries with high, medium and low income, demonstrated 41% prevalence of HT. Out of these patients, only 46.5% knew they were hypertensive. Among those who were aware of such a situation, 87.9% received treatment, but only 32.5% had their blood pressure (BP) controlled. In the last population registry of HT performed in Argentina, the prevalence was 36.3%. In 38.8% of cases, patients were unaware of their disease; 5.7% knew about it, but did not receive treatment; and 55.5% were treated, but only 24.2% had their BP controlled. (3)

This situation is mainly due to the fact that health systems are generally organized to treat acute diseases, with a design known as "radar" (4): the system is activated when the patient consults, the condition is resolved, the patient is discharged and the system is deactivated. This form of care for people with HT is inefficient and ineffective. If the patient is expected to consult spontaneously, he/she is likely to do so at an advanced stage of their disease, for example, when there is already target organ damage. In economic terms, this results in a very high cost for the patient's health and for the health care system.

In 1996, Wagner et al. (5) described a new model of care for people with chronic non-communicable diseases (CNCD), such as HT, called "Chronic Care Model" (CCM). This model is based on six components: 1) health care organization; 2) care provision system; 3) clinical information system; 4) support for decision making; 5) support for self-management; and 6) community resources. The intention is to adapt the health system to attend to CNCD focusing on the patient rather than on the disease, with programmed and planned care and not only on demand, associated with a proactive and not only reactive health team, added to an active, rather than passive patient, informed and involved in the treatment of his condition. Numerous studies have already been published that demonstrate improvements in the health and care of hypertensive patients with the application of this model. (6-8)

In 2016, the Argentine Ministry of Health published a guideline for the care of people with CNCD (4) and presented a new model of care based on the CCM. This model was called "Model for the Care of People with Chronic Diseases" (MAPEC). Our objective was to apply MAPEC in the care of people with HT in three primary health care centers (PHCC) of the city of Salta, Argentina. Patients were evaluated before, during and after the implementation of the model to assess its impact on BP control, care of hygienic-dietary measures, knowledge about HT and treatment adherence.

METHODS

This was a quasi-experimental, prospective, longitudinal study conducted between June 2018 and January 2019 in three PHCC of a peripheral urban area of the City of Salta, Argentina. Patient selection was by consecutive non-randomized sampling. Measurements were made before, during and after the monthly implementation of MAPEC, with a 6-month follow-up. The inclusion criteria were being older than 18 years of age (female or male) and on treatment for HT. Exclusion criteria were pregnancy and diagnosis of secondary HT. Only those who agreed to sign the informed written consent were allowed to participate.

Uncontrolled BP was considered in the following situations: systolic blood pressure (SBP) ≥140 mmHg and/or diastolic blood pressure (DBP) ≥90 mmHg. OMROM Hem 7220 automatic digital sphygmomanometers were used. Clinical practice guideline (CPG) recommendations were followed for a correct BP assessment, averaging two measurements at each control.

The patient was considered a tobacco user if he had smoked tobacco in the last six months (9) and sedentary if he performed less than 150 minutes a week of moderate intensity exercise. (10) The addition of salt to food during cooking or already at the table was established as not following a low sodium diet, and a diet was considered rich in fruits and vegetables when there was daily consumption of two or more servings from each food. The presence of diabetes mellitus or dyslipidemia was recorded if the patient reported being on treatment for these diseases.

To assess knowledge of the disease, the Battle test (11) was used, with the following questions or slogans:

Is HT a life-long disease?

Can it be controlled with diet and medication?

Name two or more organs that are affected by HT.

If the patient answered wrongly any of the questions or instructions, it was considered that he did not know the disease.

To assess adherence to treatment, the Morisky-Green-Levine test (12) was applied, with the following questions:

Do you ever forget to take your HT medication?

Are you careless about the time you take your medication?

When you feel better, do you stop taking the medication?

If it is not well-tolerated, do you stop taking the medication?

If the patient answered yes to any of the questions, he/she was listed as non-adherent.

To measure global cardiovascular risk (GCR), the World Health Organization/ International Society of Hypertension (WHO/ISH) risk prediction chart was used for the American B sub-region which takes into account sex, age, whether the patient is or not diabetic and/or tobacco user, his/her total blood cholesterol and SBP. (13)

For the implementation of MAPEC, the following actions were carried out with respect to each component included in the model:

1) Health care organization: the patient was given a "Self-monitoring" form, to record BP values in the monthly BP controls, the main results of the inter-consultations (which constitute a reference and counter-reference tool) and the attendance to educational workshops and physical activities. Anthropometric measurements, presence of a sedentary lifestyle, knowledge of HT, adherence to treatment, attention to a low sodium diet but rich in fruits and vegetables, as well as laboratory results (blood glucose; total cholesterol and triglyceride levels) were also recorded at the beginning and end of the follow-up period. To corroborate the assistance to inter-consultations, an active summons of the patients was made by telephone contact or message (WhatsApp).

2) Care provision system: Scheduled and protected appointments were established. The patient's BP was monitored monthly without the need to request an appointment and the medication was provided, adjusting the treatment if necessary. The patient was treated by an interdisciplinary team.

3) Clinical information system: A complete clinical history of each patient was kept following CPG, with the corresponding request for inter-consultations and laboratory analyses.

4) Support for decision-making: A CPG update on HT was carried out monthly for the entire health team, placing CPG in digital format in the office computers.

5) Self-management support: Monthly workshops were held with patients to promote HT self-management. They were also offered a weekly physical activity led by PHCC staff. The "Self-monitoring" form was used by patients to request the scheduled appointments and follow the evolution of their health parameters. Brochures and posters were made for the waiting room of each PHCC. A telephone message group (WhatsApp) was established to keep the patient informed of the activities.

6) Community resources: Community leaders from the PHCC responsible area were invited to health education workshops on HT, which was an opportunity to discuss common goals and inquire about the needs of the community.

Mean BP of the study patients (MAPEC patients) was compared with that of other patients treated in three PHCC located within the same area of our study in which MAPEC was not implemented (Non-MAPEC patients). Nursing records performed in the usual care of these patients in the same period covered by our work were used. The inclusion and exclusion criteria and the conditions for BP measurements were identical to those followed with MAPEC patients.

Statistical analysis

Statistical data processing was performed using InfoStat® software. Means, medians and standard deviations were obtained for quantitative variables, and absolute and relative frequencies and percentages were calculated for qualitative variables. The chi-square test of independence and homogeneity was used to analyze the relationship between categorical variables and Student's t-test for independent and paired samples. The level of statistical significance was $p<0.05\%$.

Ethical considerations

The study protocol and the informed consent were approved by the Research Ethics Committee of the Health Research Board of the Province of Salta.

RESULTS

The final sample consisted of 325 patients, and results were analyzed from 232 (Figure 1). Mean age was 58.01±10.7 years (range 26-92 years) and 64.6% were women. Table 1 summarizes patient demographic and clinical characteristics.

The results obtained before and after MAPEC intervention showed highly significant differences ($p<0.0001$) in mean SBP and DBP, BP control, degree of sedentary lifestyle, attention to a low sodium diet, high consumption of vegetables, knowledge of the disease and adherence to treatment (Table 2). Mean SBP and DBP decreased by 12.97 mmHg (95% CI: 9.52-16.42) and 6.93 mmHg (95% CI: 4.70-9.16), respectively. In the rest of the variables, statistically significant differences were found, except in those related to overweight, obesity and cervical and abdominal obesity.

In 211 patients it was possible to compare labora-

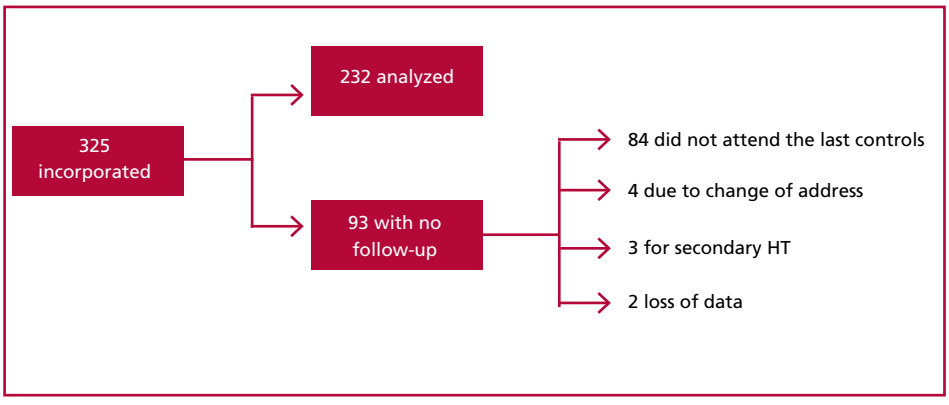

Fig. 1. MAPEC patients' flow chart

tory results and global cardiovascular risk (GCR) at the beginning and end of the intervention (Table 3). There were statistically significant differences in GCR (p=0.017). An increase in the GCR group ratio <10% was observed at the end of the intervention, at the expense of a decrease in the other risk groups.

In 69/203 (33.99%) of the patients, medical treatment changed due to medical indication during the intervention period and in 27/69 (39.13%) cases it was to decrease drug doses.

Measurements during the intervention in the MAPEC group compared with those in the non-MAPEC group showed that mean SBP was significantly lower (p <0.003) in MAPEC patients, but not DBP (p=0.25) (Table 4).

DISCUSSION

Results show the influence of MAPEC implementation on the health parameters of patients included in this study. Significant improvements were found at the end of the intervention in variables such as sedentary lifestyle, attention to a low sodium diet, high consumption of vegetables, knowledge of the disease and adherence to treatment. Blood pressure control was significantly improved, with a significant decrease in SBP and DBP. Probably due to the decrease in SBP, patients' GCR decreased. It should be pointed out that SBP is more directly related to cardiovascular risk. (14) The decrease in mean SBP and DBP with the intervention was approximately 13 and 7 mmHg, respectively. This reduction in BP could have great clinical relevance, since a decrease of 10 mmHg in SBP and 5 mmHg in DBP has been shown to decrease the probability of cardiovascular events by 20%, total mortality between 10 and 15% and stroke by 35%. (15, 16)

In 34% of the patients there were treatment changes during follow-up as part of the model's care provision system, although in 39% of these cases changes were dose reductions.

This new care model shares with the CCM the six components for its application. CCM is the model with the longest development and the most studied internationally. During the last decade the work in primary care has shown improvements in care processes and in patient health, although the components of the model have not been simultaneously applied in the majority of cases, as is the case of our study.

With a design similar to that of our work, Serumaga et al. (17) studied a single element of the CCM (health care organization) in primary care of hypertensive patients in England, and found no significant difference in BP at the end of the intervention. In our study, very significant differences were found in mean SBP and DBP, but employing all the elements of the model.

Allaire et al. (6) carried out a case-control study, with pre- and post-intervention measurements, in 16,366 African American hypertensive patients in pri-

Table 1. Demographic and clinical characteristics of MAPEC patients. (n = 232)

Variable	n	%
Age, mean±SD (years)	58.01 ± 10.7	
Female sex	150	64.6
Social security	120	51.72
Dyslipidemia	143	61.63
Diabetes	59	25.43
Smoking	33	14.22
HT in first and second-degree relatives	156	67.24

HT: Hypertension

Table 2. Comparison of MAPEC intervention at the onset and end of the study

Variable	Onset	End	*p**value
	n=232 (%)	n=232 (%)	
Controlled BP	107 (46.12)	178 (76.72)	<0.0001
Mean SBP	139.37±21.36	126.4±12.51	<0.0001†
Mean DBP	88.26±13.72	81.32±8.76	<0.0001†
Overweight/obesity	219 (94.39)	212 (91.37)	0.2
Abdominal obesity	222 (95.68)	220 (94.82)	0.66
Cervical obesity	183 (78.87)	166 (71.55)	0.07
Sedentarism	149 (63.40)	83 (36.24)	<0.0001
Low sodium diet care	110 (47.41)	176 (75.86)	<0.0001
High fruit intake	134 (57.75)	165 (71.12)	<0.026
High vegetable intake	149 (64.22)	193 (83.18)	<0.0001
Knowledge of HT	94 (40.51)	210 (90.51)	<0.0001
Adherence to treatment	121 (52.15)	185 (79.74)	<0.0001

*According to the chi-square test of independence, except in †, where Student's t test for paired samples was applied. BP: Blood Pressure, SBP: Systolic Blood Pressure, DBP: Distolic Blood Pressure HT: Hypertension

Table 3. Laboratory results and global cardiovascular risk in MAPEC (n = 211)

Variable	Onset	End	$p^{\ddagger}$ value
Abnormal fasting blood glucose	44.27%	38.30%	0.13
Hypercholesterolemia	46.76%	38.80%	0.07
Hypertriglyceridemia	51.74%	42.78%	0.16
GCR<10%	69.35%	82.00%	
GCR 10-20%	19.60%	13.00%	0.017
GCR 20-30%	6.53%	2.00%	
GCR >30%	4.52%	3.00%	

‡ According to the chi square test of independence. GCR: Global cardiovascular risk.

Table 4. Mean SBP and DBP (mmHg) in MAPEC vs. non-MAPEC patients

	MAPEC	Non-MAPEC	$p^{\S}$ value
Mean SBP	129.91±17.92	133.59	0.0039
Mean DBP	83.36±11.22	82.49	0.2578

According to Student's t test for paired samples. SBP: Systolic Blood Pressure y DBP

mary care in the United States, to evaluate a decision support program. These authors found a statistically significant decrease in SBP with the intervention, after 24 months.

Davy et al. (7) carried out a systematic review of studies performed at the first level of care in countries with medium to high income and concluded that, except for two studies, all of them showed improvements in the health parameters of chronic patients (mostly diabetic, and , secondly, hypertensive patients) with CCM implementation. The most used model elements were the self-management support and care provision system. However, the cited authors point out that it was not possible to demonstrate which combination of CCM elements was the most effective, and that there was a risk of bias.

Reynolds et al. (8) carried out a systematic review of studies concerning primary care patients from high-income countries with different chronic diseases (especially HT and diabetes) in which CCM was applied. These researchers found significant differences in the participants' health improvement with the combination of at least two components of the CCM. The most widely implemented component was self-management support.

The limitation in the comparison of mean BP between MAPEC and non-MAPEC is that, contrary to the MAPEC group, there was no follow-up in the other group. To counter this limitation, the comparison was not made with the mean final measurement of the MAPEC patients, but with all the measurements made during the course of the intervention.

We do not rule out the following biases in our study: selection, loss to follow-up, recollection, misunderstanding, adaptation, attention, obsequiousness, and incomplete or erroneous data collection.

The loss to follow-up was 28.6% and this could also have influenced the results. However, this situation shows the tendency of these chronic patients not to attend health check-ups. Despite possible biases and loss to follow-up, the statistical tests used were powerful enough to detect significant differences.

We consider that the main characteristics of MAPEC have been fulfilled in this project. Person-centered and not exclusively disease-based care has been planned, the health team has shown a proactive attitude, and scheduled and planned care has been provided to the patient, resulting in an informed patient involved in his/her condition.

The medical, health care, financial, personal and family burden of CNCD is one of the main current threats to health systems. (18) The main obstacle is the difficulty in providing adequate and efficient care to this population. (19)

WHO set in September 2011 a series of targets to reduce by 25% the risk of premature death from CNCD by 2025. (20) The strategy of the Pan American Health Organization (PAHO) for the prevention and control of CNCD for the 2012-2025 period (21) has, among its main policies, the response of health systems to CNCD. We consider this research to be in line with these goals.

CONCLUSIONS

MAPEC could be implemented in PHCC with the available human resources and without significant expenditures. It could be used in other PHCC with easy application tools. This is a realistic goal, since the Ministry of Health of Argentina is currently carrying out the Project for the Protection of the Vulnerable Population against CNCD (22), which has among its objectives the improvement of public care center conditions to provide services of high quality in patients with these diseases.

Conflicts of interest

None declared.

(See authors' conflicts of interest forms on the website/ Supplementary material)

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