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REVISTA DE ENFERMAGEM DA UFSM

UFSM
Rev. Enferm. UFSM - REUFSM
Santa Maria, RS, v. 11, e77, p. 1-16, 2021
DOI: 10.5902/2179769265985
ISSN 2179-7692

Relato de Experiência Submissão: 27/05/2021 Aprovação: 22/09/2021 Publicação: 11/11/2021

Blood pressure screening programs: a case report*

Programas de rastreamento da pressão arterial: relato de experiência

Programas de detección de la presión arterial: un informe de experiencia

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Abstract: Objective: To report on the experience of developing and implementing Blood Pressure Screening Programs carried out in Brazil from 2015 to 2018. **Method:** A case report conducted in five Brazilian cities, covering the following stages: Elaboration, cooperation, recruitment, development, planning, training, dissemination, execution, and analysis. **Results:** Partnerships with public and private institutions were established for the implementation of the screening. Students and healthcare providers were trained to measure blood pressure, fill out the data collection instrument, and orient the participants. A schedule was prepared to address the locations, dates, times, human resources, and supplies needed to carry out the activities. The indicators prevalence, knowledge, treatment, and hypertension management comprised the descriptive analysis of the collected data. **Conclusion:** The methodological procedures presented in this study are capable of supporting the development and implementation of systematized blood pressure screening programs in Brazil.

Descriptors: Mass Screening; Hypertension; Arterial Pressure; Blood Pressure Determination; Cardiovascular Disease

Resumo: Objetivo: relatar a experiência da construção e implementação de Programas de Rastreamento da Pressão Arterial realizados no Brasil entre os anos de 2015 e 2018. **Método:** relato de experiência conduzido em cinco municípios brasileiros, por meio das etapas: elaboração, cooperação, recrutamento, desenvolvimento, planejamento, treinamento, divulgação, execução e análise. **Resultados:** para a implementação do rastreamento foram estabelecidas parcerias com instituições públicas e privadas. Estudantes e profissionais de saúde receberam capacitação para realizar a medida da

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*** Extracted from the Post-Doctoral Program of the Ribeirão Preto College of Nursing of the University of São Paulo, 2020.**

pressão arterial, preencher o instrumento de coleta de dados e orientar os participantes. Um cronograma foi elaborado para atender aos locais, datas, horários, recursos humanos e insumos necessários para a realização das atividades. Os indicadores prevalência, conhecimento, tratamento e controle da hipertensão arterial compuseram a análise descritiva dos dados coletados. **Conclusão:** os procedimentos metodológicos apresentados neste estudo são capazes de sustentar a construção e a implementação de programas sistematizados de rastreamento da pressão arterial no Brasil.
Descritores: Programas de Rastreamento; Hipertensão; Pressão Arterial; Determinação da Pressão Arterial; Doenças Cardiovasculares

Resumen: **Objetivo:** reportar la experiencia de construcción e implementación de Programas de Detección de la Presión Arterial realizada en Brasil entre 2015 y 2018. **Método:** informe de experiencia realizado en cinco municipios brasileños, a través de los pasos: elaboración, cooperación, reclutamiento, desarrollo, planificación, capacitación, difusión, ejecución y análisis. **Resultados:** para la implementación del seguimiento se establecieron alianzas con instituciones públicas y privadas. Se capacitó a estudiantes y profesionales de la salud para medir la presión arterial, completar el instrumento de recolección de datos y orientar a los participantes. Se elaboró un cronograma para conocer los lugares, fechas, horarios, recursos humanos e insumos necesarios para realizar las actividades. Los indicadores de prevalencia, conocimiento, tratamiento y control de la hipertensión arterial comprendieron el análisis descriptivo de los datos recolectados. **Conclusión:** los procedimientos metodológicos presentados en este estudio pueden apoyar la construcción e implementación de programas de detección sistemático de la presión arterial en Brasil.
Descriptores: Tamizaje masivo; Hipertensión; Presión Arterial; Determinación de la Presión sanguínea; Enfermedades Cardiovasculares

Introduction

Hypertension (HTN) is the main risk factor for the onset of cardiovascular diseases, affecting 33% of adults and accounting for 22% of deaths worldwide.[1-3] In Brazil, it affects approximately 30% of the population, and disease control rates do not exceed 40%.[4-5] Epidemiological data obtained in low- and middle-income countries have demonstrated that failures in diagnosis, difficulty in adhering to medication treatment, and lack of management of blood pressure (BP) levels are directly related to socioeconomic disparities and the poor performance of primary healthcare systems in the management of HTN.[6]

The difficulty of accessing healthcare services and periodically assessing BP values has led to the development of worldwide campaigns aimed at raising public awareness on the importance of early diagnosis and management of HTN.[7] These campaigns aim to contribute to a 25% reduction in high BP levels by the year 2025, as proposed in the set of global goals proposed by the World Health

Organization (WHO) in 2013.[8]

Since then, the World Hypertension League (WHL) has been disseminating resources to collaborate with the implementation and sustainability of Blood Pressure Screening Programs (BPSP) in underdeveloped and emerging countries, focusing on process simplicity, quality of information, low cost, population accessibility, health education, and training of multi-professional teams.[9]

The BPSP outlined with methodologies proposed by the WHL and implemented in countries in America, Europe, Africa, Asia and Oceania reached more than 1.5 million people in 2019 and presented promising results regarding the promotion of knowledge on HTN and the global identification of untreated patients with HTN or those refusing to adhere to medication treatment.[10] These initiatives have subsidized the involvement of international public health organizations in the development of management documents aimed at standardizing the monitoring and evaluation of interventions aimed at managing BP, applied in different geographic locations.[11]

In Brazil, BP screening campaigns have been implemented in small population samples, independently and opportunistically, with limited investments from the public or private sectors.[12] Even in partnership with the WHL, these initiatives have been applied sporadically throughout the country, in regions, or places selected for convenience.[4] In addition to the limited number of scientific evidence proving the efficacy of these initiatives, the limited participation of the public sector in the elaboration and dissemination of strategic plans for BP screening restricts the development of programs with positive effects on the prevention, treatment, and control of HTN.[13]

It is believed that the implementation of BPSP in Brazil, based on systematized methodologies currently applied in developing countries, can contribute to the early diagnosis of HTN, the promotion of knowledge to the population, adherence to medication treatment, and the reduction of uncontrolled BP rates nationwide. Given the above, the objective of this study was to report the experience of the development and implementation of Blood Pressure Screening Programs carried out in Brazil from 2015 to 2018.

Method

This is a case report on the development and implementation of Blood Pressure Screening Programs in Brazil, conducted by the Brazilian Advisory Committee for Blood Pressure Screening Programs, CCB-PRPA (*Comitê Consultivo Brasileiro para os Programas de Rastreamento da Pressão Arterial*), in the period from 2015 to 2018, in the cities of Franca, Ribeirão Preto, Campinas, and São Paulo, located in the state of São Paulo, and in the city of Alfenas, located in the state of Minas Gerais.

The CCB is a class, non-profit organization established in 2015 and composed of researchers from different Brazilian universities, leaders of specialist societies, and healthcare providers with vast clinical experience in HTN. Its purpose is to support WHL initiatives in Brazil and to develop resources for the implementation of BPSP in different communities nationwide.

The methodological procedures established by the CCB for the development and implementation of BPSP in Brazil comprise the following stages: elaboration, cooperation, recruitment, development, training, planning, dissemination, execution, and analysis. Chart 1 describes these methodological steps and their objectives.

Chart 1 - Methodological steps and objectives for the development and implementation of Blood Pressure Screening Programs in Brazil. São Paulo, SP, Brazil, 2020

Methodological steps	Objectives
1 – Elaboration	To develop research projects with the purpose of implementing the BPSP in different Brazilian cities, according to the guidelines of the World Hypertension League.
2 - Cooperation	To establish partnerships with government, welfare, business, and educational institutions, as well as with members of specialist societies and research groups associated with different Brazilian universities to support the execution of the BPSP.
3 - Recruitment	To invite students and healthcare providers from different fields of study to participate as BPSP instructors.
4 - Development	To develop data collection forms and educational activities to be applied to the research participants.
5 - Planning	To establish a schedule of activities with locations, dates, times, human resources, and supplies needed to carry out the BPSP in the cities listed for the study.
6 - Training	To train the BPSP instructors to perform the technical procedures, the completion of data collection instruments, and the guidance on the ethical aspects of scientific research to the

	study participants.
7 - Dissemination	To disseminate the BPSP on social networks, websites, local radio and magazines.
8 – Execution	To ensure the execution of the BPSP according to the research project and the methodological steps established by the Brazilian Advisory Committee.
9 – Analysis	To store the information obtained in databases and conduct statistical analyses that contemplate the measurement of indicators of prevalence, knowledge, treatment, and management of hypertension, according to the recommendations of the World Hypertension League.

BPSP: Blood Pressure Screening Programs

This project was approved by the Research Ethics Committee of the proponent institution, as determined by Resolution 466/2012 of the National Health Council, under legal opinion number 1,129,356, on June 26, 2015.

Results

Step 1 - Elaboration

The elaboration of the BPSP in Brazil was conceived in 2014, following a meeting of Brazilian researchers with WHL leaders who planned to organize educational initiatives that could contribute to the implementation of BPSP in underdeveloped and emerging countries. From this meeting, HTN specialists established the CCB and set out to design research projects with strategies that would attend to communities in different regions of Brazil.

The CCB developed a pilot project by using an observational method, with non-probabilistic sampling, delineated by convenience, in which participants older than or equal to eighteen years old, residing in the cities of Ribeirão Preto, São Paulo, Franca, Campinas, and Alfenas, would be included. These cities were selected by the project researchers due to the location of the health institutions and universities to which they were affiliated. People presenting cognitive impairment identified by the researchers at the time of data collection, that is, impaired communication with the participant and difficulty in understanding any phase of the research, were excluded.

Step 2 - Cooperation

Members of specialist societies and research groups associated with different Brazilian health institutions and universities have been contacted and invited to participate in the BPSP. Partnerships were established among members of the Ribeirão Preto College of Nursing of the University of São Paulo (EERP-USP), Ribeirão Preto College of Medicine of the University of São Paulo, Ribeirão Preto College of Pharmaceutical Sciences of the University of São Paulo, College of Nursing of the State University of Campinas, University of Franca, Federal University of Alfenas, University Center Barão de Mauá, Heart Institute of Hospital das Clínicas of the University of São Paulo Medical School, Hospital das Clínicas of Ribeirão Preto Medical School of the University of São Paulo, Brazilian Society of Hypertension and Brazilian Society of Cardiology.

Prior to the execution of the BPSP, governmental, welfare, business, and educational institutions were contacted to authorize the performance of the screening procedures in each of the cities.

Step 3 - Recruitment

University professors, healthcare providers, and nursing, physical therapy, and medical students at the undergraduate and graduate levels, belonging to the specialist societies and research groups of the partner institutions, were invited to participate in the BPSP as instructors. An invitation letter, containing information on the objectives and the schedule of screening activities, was sent by the researchers to all the invited participants via e-mail 30 days prior to the teams' training schedule.

The teams were composed of one coordinator of a specialty field (belonging to the CCB) and 15 healthcare providers or undergraduate and graduate students in nursing, physiotherapy, and medicine.

Step 4 - Development

Data collection form

To meet the needs of this research and establish a protocol for BP screening, the CCB prepared

the "Data collection form - BPSP in Brazil" based on an instrument developed and validated by the Blood Pressure Screening Expert Group - WHL and available in the online document "A 'Train the Trainer' Module for Developing Blood Pressure Screening Programs" (whleague.org). This form was developed by the WHL leaders for the purpose of implementing BPSP in the global context and in underdeveloped and emerging countries. For this purpose, the instrument was composed of six parts, with simple questions that were easy to understand and apply, which intended to investigate the following: The participant's knowledge on the diagnosis of HTN, adherence to medication and non-medication treatment, the presence of cardiovascular risk factors, BP values, anthropometric data, and the presence of symptoms during screening. The questions that composed the form are described in detail below.

A) Participant identification: name, age, sex, phone number, e-mail address, and city.

B) Six dichotomous yes/no questions:

1) Has a physician or another healthcare provider ever told you that you have high BP or HTN?

2) Are you taking or have you recently taken high BP medications that have been prescribed by a physician or another healthcare provider?

3) Are you undertaking and/or have you received orientation from healthcare providers on reducing alcohol and salt intake, weight loss, physical activity, and smoking cessation?

4) Are you receiving treatment or counseling for any cardiovascular disease?

5) Are you receiving treatment or counseling regarding type 2 diabetes mellitus?

6) Do you have a family history of cardiovascular disease?

C) A field for filling in the BP measurement procedure data: brachial circumference measurement, arm selected for the measurement, cuff size used, BP values, and heart rate values.

D) A field for filling in anthropometric data: weight, height, and Body Mass Index (BMI).

E) A multiple-choice question to describe whether the participant reported any symptoms during the screening (chest pain, shortness of breath, blurred vision, malaise, nausea, other).

F) A multiple-choice question to describe when the participant was instructed to re-measure BP or seek medical attention (check BP annually, seek medical attention in a few weeks, or seek medical attention as soon as possible).

The questions on the form were applied during the screening campaigns to residents of the cities that hosted the project's partner institutions (Ribeirão Preto, São Paulo, Franca, Campinas, and Alfenas).

Educational Resources

An illustrated educational manual entitled "My Blood Pressure" was developed by the Interdisciplinary Research Group on Hypertension (GIPHA) of EERP-USP in partnership with the *Groupe Interdisciplinaire de Recherche Appliquée en Santé of the Université du Québec à Trois Rivières*. This manual was developed with the purpose of informing and educating the community on the definition of HTN, the complications of the disease, altered BP values, cardiovascular risk factors, and the importance of a healthy lifestyle with emphasis on dietary care, physical exercise, reducing salt and alcohol consumption, smoking cessation, and follow-up with healthcare providers.

A healthcare card was also prepared, named "Patient Information", on which the instructor should fill in the date and time of the screening, as well as the BP value, the size of the cuff used in the procedure, the heart rate, and the time interval in which the participant should re-measure BP or seek medical assistance from healthcare providers.

Step 5 - Planning

The BP screening dates were planned according to the commemorative days for the prevention and control of HTN. Data collection was performed on April 24, 25, and 26 of 2015, 2016, and 2018, the period when the National Day for Prevention and Fight Against Hypertension was promoted; on May 15, 2016, in commemoration of the World Hypertension Day, and during the month of February 2016. The campaigns lasted an average of five hours a day and took place in public places, easily accessible and with a large flow of people, such as hospitals, bus terminals, subway stations, public

squares, city centers, and shopping malls. For the open-air actions, tents were set up to protect the participants and the material and human resources from exposure to sun, heat, cold, or rain. For the other locations, the screening space was defined with the assistance of furniture (tables, chairs, and equipment) in hallways and places with a large flow of people.

Following the definition of dates and times, the CCB established a schedule for the acquisition of permanent and consumable resources, which were made available during the week of the screening campaigns, by the partner institutions participating in the project. Regarding human resources, a minimum of six and a maximum of twenty instructors per day or screening period were selected. The instructor groups were recruited 30 days prior to the beginning of the campaigns and consisted of university professors, undergraduate and graduate students, and healthcare providers from the fields of nursing, physiotherapy, and medicine.

Step 6 - Training

The instructors were trained prior to the screening campaigns in order to provide educational support on the technique of indirect BP measurement with oscillometric devices, completion of the data collection form, and completion of the Informed Consent Form (ICF).

A total of four face-to-face and distance meetings were scheduled, held at least 20 days before the campaigns, and coordinated by the CCB leaders. Each meeting lasted approximately two hours. The teaching strategies used were as follows: An expository dialogical class and the presentation of illustrated educational resources, developed in partnership with members of the WHL.

Step 7 - Dissemination

The BP screening campaigns were disseminated by the CCB members in each of the cities according to the introduction of the National Day for the Prevention and Fight Against Hypertension and the World Hypertension Day, through social networks, websites, local radio stations and magazines.

Step 8 - Execution

The instructors were advised to arrive one hour before the start of the screening activities to be oriented regarding the task allocation: Approaching the participants, informing them on the research, signing the ICF, filling out the data collection form, measuring BP, and handing out the educational resources.

The group of instructors and the participants who composed the study sample signed the ICF, with one copy handed to the participant and another to the researchers. They were informed of their anonymity and that the research results would be published in journals and disseminated in national and international scientific events.

The approach towards the screening participants was carried out in a public place by the group of instructors, who invited the passers-by to have their BP measured and to receive the educational resources.

The instructors invited the participants to sit on a chair, with appropriate posture, and performed four consecutive BP measurements, according to the techniques recommended by the Brazilian Hypertension Guidelines and the Canadian Hypertension Educational Program.[3,14-15] Omron® oscillometric electronic devices, model HEM-7200, were used, duly calibrated, and validated according to the protocol established by the European Society of Hypertension.[16]

The heart rate (HR) values were automatically recorded by the oscillometric device and the systolic blood pressure (SBP) and diastolic blood pressure (DBP) values were obtained through four oscillometric measurements, one in each arm and two more measurements in the arm that presented the highest BP value. The reading obtained in the arm with the lowest BP value was discarded, and the values of the three subsequent measurements (M1, M2, and M3), measured in the opposite arm, were compared to each other. The mean values of M2 and M3 were categorized as normal BP (<140/90 mmHg), high BP (140-179/90-109 mmHg), or extremely high BP (≥180/110 mmHg).[3]

After the procedure, the data collection form was filled out by the instructors. Weight and height values were referred by the participants during the data collection period. BMI was categorized as normal (up to 24.9kg/m2), overweight (greater than or equal to 25kg/m2 and less than or equal to 29.9kg/m2), and obese (greater than or equal to 30kg/m2).3 The attendance card was filled out by the instructors immediately after the indirect BP measurement procedure was carried out (with an automated device and arm cuff) and handed to participants along with the illustrated educational manual.

Step 9 – Analysis

The following variables were available for the statistical analyses: screening city, sex, age, BMI, SBP, DBP, HR, participants' knowledge of the HTN diagnosis, and use of antihypertensive medications.

The indicators prevalence, knowledge, treatment, and management of HTN were measured according to the WHL recommendations.[17]

- The prevalence of HTN was measured in participants who averaged the last two measurements of SBP≥140 or DBP≥90 mmHg or responded affirmatively to questions 1 or 2 on the data collection form.
- Knowledge of the HTN diagnosis was considered positive in the participants who responded "yes" to question 1 of the data collection form.
- The treatment of HTN was considered positive in the participants who responded "yes" to question 2 of the data collection form.
- The management of BP values was considered positive in participants who presented an average of the last two measurements of SBP<140 or DBP<90 mmHg and responded "yes" to question 2 of the data collection form.

Discussion

The need to unify BPSP with public policies on cardiovascular health is not a novel issue; however, efforts to address HTN have been carried out independently, on a small scale, in a short period, and have consumed costly investments and resources from the health sector.[11]

Facing this scenario and the burden of cardiovascular disease on the high mortality rates associated with the increase in BP, the CCB proposed to develop the BPSP in Brazil, with the application of systematized procedures, based on methodologies used in the international scenario, which have demonstrated effective results regarding the prevention, treatment, and management of HTN, through sustainable, easy-to-implement, low-cost, and highly replicable initiatives.[1,10,18-23]

In 2017, the global campaign entitled "May Measurement Month" (MMM), promoted by the WHL, tracked BP values of 7260 people in the main Brazilian regions and used a protocol developed by the International Society of Hypertension (ISH),[4] freely available at https://maymeasure.org. This protocol, composed of the methodological steps presented in this study, has been used in more than 100 countries and has proven to be effective in identifying altered BP values in people aged 18 years or older.[1] In addition, it allowed the orientation of the screened population regarding the maintenance of a healthy lifestyle and the importance of periodically evaluating the BP values.

The methodological steps used in BPSP were developed with a simple language to favor the training of multi-professional teams from different regions of the world and to guarantee assertiveness in data collection. In addition, the incentive to develop screening campaigns with limited resources and low costs has the purpose of increasing the applicability of this strategy at a global level, motivating the development of public policies aimed at the screening for HTN, and overcoming the difficulty of access to health services by the population.[13,24-25]

The MMM results in 2017 demonstrated a high prevalence of HTN in Brazil (47%), high rates of uncontrolled BP (40%), and the participants' lack of knowledge regarding their BP values (19%).4 Given this scenario and the high percentage of new cases of HTN, the implementation of BPSP could

contribute to the population's awareness of the impact of the disease on cardiovascular health. It is believed that the methodological procedures presented in this case report are capable of supporting the development and implementation of BPSP in Brazil since they aim to favor the systematization of community initiatives in different cities throughout the country.

Conclusion

The case report presented in this study describes the methodological steps of the development and implementation of BPSP in Brazil between 2015 and 2018. These initiatives, based on internationally consolidated proposals, are suggested to measure the implications of HTN as a cardiovascular risk factor and to collaborate with the development of public policies aimed at providing health education, early diagnosis, and management of HTN in different communities.

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Acknowledgement: We would like to thank the Blood Pressure Screening Expert Group - World Hypertension League and the Brazilian Advisory Committee for Blood Pressure Screening Programs, CCB-PRPA (*Comitê Consultivo Brasileiro para os Programas de Rastreamento da Pressão Arterial*) for their partnership in the planning and execution of the activities presented in this work.

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How to cite this article

Daniel ACQG, Veiga EV, Candido SS, Bachur CK, Lamas JLT, Fava SMCL. Blood pressure screening programs: a case report. Rev. Enferm. UFSM. 2021 [Acesso em: Anos Mês Dia]; vol.11 e77: 1-16. DOI: https://doi.org/10.5902/2179769265985