

TELEMONITORING HYPERTENSIVE PATIENTS IN PUBLIC HEALTH DURING THE PANDEMIC PERIOD: A NARRATIVE LITERATURE REVIEW

Isabela Siyao Chen

Universidade Vila Velha

Vila Velha -ES

<http://lattes.cnpq.br/4138337642874400>

Víctor Amaral Guerreiro

Universidade Vila Velha

Vila Velha -ES

<http://lattes.cnpq.br/7154325516914467>

André Louzada Colodette

Escola Superior de Ciências da Santa Casa de
Misericórdia de Vitória

Vitória – ES

<http://lattes.cnpq.br/8746648607856548>

Carlos Eduardo Favoretti de Souza

Universidade Vila Velha

Vila Velha -ES

<https://lattes.cnpq.br/6373827462581503>

Eduarda Maria Cetto Meira

Centro Universitário Redentor - Uniredentor

Itaperuna - RJ

<http://lattes.cnpq.br/1967594577667658>

Eduardo Casella Marques

Universidade Vila Velha

Vila Velha -ES

<http://lattes.cnpq.br/4352362273625471>

All content in this magazine is licensed under a Creative Commons Attribution License. Attribution-Non-Commercial-Non-Derivatives 4.0 International (CC BY-NC-ND 4.0).



Lara Aliprandi Rocha
Universidade Vila Velha
Vila Velha -ES
<https://lattes.cnpq.br/5908969037358349>

Mariana Di Paula Rocha Rodrigues
Universidade Federal de Viçosa
Viçosa – MG
<https://lattes.cnpq.br/0451854992091863>

Pedro Henrique Bridi
Universidade Vila Velha
Vila Velha -ES
<https://lattes.cnpq.br/5542254694852292>

Gabriel Costa Rodil
Universidade Vila Velha
Vila Velha – ES
<http://lattes.cnpq.br/8203792948075295>

Ronald Curttes Acipreste Junior
Universidade Vila Velha
Vila Velha – ES
<http://lattes.cnpq.br/3293878458877111>

Sérgio Emilio Rua
(Orientador)
Universidade Vila Velha
Vila Velha - ES
<http://lattes.cnpq.br/0771353030354065>

Abstract: This article aims to elucidate the main characteristics, advantages and disadvantages of using telemonitoring of arterial hypertension. In addition to understanding the structure of the unified health system (SUS) and how the monitoring of patients with hypertension is carried out, evaluating the feasibility of carrying out telemonitoring in the public health system.

Keywords: Telemonitoring; Public health; Hypertension; Revision.

INTRODUCTION

Telemonitoring is a remote monitoring method that uses communication technologies to distribute information about the patient's health condition to the physician (SIN et al., 2020). Blood Pressure Telemonitoring (TPA) is performed through Blood Pressure (BP) monitors that collect, store and send vital patient data to the physician's computer, such as blood pressure and other health indicators (OMBONI et al., 2020)

The main benefits of the most important application of telemedicine, telemonitoring, assists in dehospitalization, preventive health, early diagnosis, increased life expectancy, greater comfort, increased hours worked, among others. In addition, its use is an important alternative for the management of Chronic Noncommunicable Diseases (NCDs) by national health systems, such as the Unified Health System (SUS) in Brazil, given the constant increase in costs. (PAULA et al., 2020)

The comparative analysis between the two methods of monitoring blood pressure has gained importance with the persistent pandemic caused by Sars-Cov-2, since there is an increased need for new means of intervention in public health that respect sanitary and health measures. prevention of COVID-19. The exposition of the divergences of both methodologies clearly and didactically

indicates the positive points of telemonitoring, such as accessibility in different socioeconomic contexts, as it is capable of monitoring BP from a distance.

The importance of seeking new alternatives to democratize access to public health through technological innovations available in the national territory, can be an option not only while the health crisis lasts, but mainly to adapt to the needs and present themselves as a solution to the shortcomings of the Brazilian health system. However, for this to happen, it is necessary to evaluate traditional methods and telemedicine, with the aim of not only pointing out the shortcomings of both, but also the cost-effectiveness in the long term.

DISCUSSION

HISTORICAL APPROACH

The Venetian physician Santorio Santorio (1561-1636) and Galileo Galilei (1571-1630) were the first, in historical records, to attempt to measure the pulse. They invented the *pulsilogium*, a device that was used to measure the frequency and variation of the pulse. However, it was Stephen Hales (1677-1761) who made the first measurement of blood pressure (BP) in an animal. Jean Léonard Marie Poiseuille (1799-1869), in turn, improved the Hales manometer and called it a hemodynamometer, a glass tube in the shape of a “U” partially filled with mercury (Hg) that was directly inserted into the artery of the animal in experiment, measuring its BP in an invasive way, through the difference in millimeters, observed in the level of mercury (Hg). The hemodynamometer, however, was used only in the laboratory, without practical clinical use.

In 1834 there was the first attempt by the French physician, J. Hérrison and P. Gernier (engineer), to measure blood pressure in a less invasive way. The instrument they developed was the first to be called “sphygmomanometer”

(Gr. *Sphygmos* = pulse). Since then, several innovations to measure blood pressure in a non-invasive way and adapted to the clinical office have emerged, including the discovery of what Systolic and Diastolic Blood Pressure (SBP and DBP) was, as well as how to measure it numerically and the Korotkoff sounds were ratified. (INTROCASO, 2019)

ARTERIAL HYPERTENSION

It is a disease characterized by unbalanced blood pressure levels and, as a consequence, has direct and indirect cardiovascular repercussions. Systemic Arterial Hypertension (SAH) is responsible for approximately 50% of deaths caused by diseases originating in the heart and vessels (SCALA et al., 2015), such as heart attack, chronic renal failure and stroke. Obesity, smoking, advanced age, alcoholism, sedentary lifestyle, hypernatremia, low income and genetic factors are mentioned as predisposing factors for SAH. (MALACHIAS et al., 2016)

Currently, the hypertension guidelines in the country determine as optimal the Systolic Blood Pressure lower than 120mmHg and DBP lower than 80mmHg, individuals with systolic pressure above 140mmHg and that exceeds 90mmHg in the diastolic can be considered hypertensive. (BARROSO et al., 2021)

The importance of preventing this pathology is given by the burden of cardiovascular disease and mortality attributed to high blood pressure. A study published in the *Global Burden of Disease* reported that 14% of all deaths worldwide in 2001 were due, directly or indirectly, to a systolic pressure above 115 mmHg. Approximately 80% of these deaths occurred in low and medium development countries and in age groups between 45 and 60 years old, causing enormous financial losses to health systems worldwide (MAGALHÃES et al., 2010). According to the World Health

Organization (2003), hypertension causes the death of about 9 million people per year.

EPIDEMIOLOGY OF ARTERIAL HYPERTENSION IN BRAZIL

Systemic Arterial Hypertension consists of one of the most prevalent diseases among patients in Brazil and in the world, and data indicate that its prevalence can reach as much as 32.5% (36 million) of adult individuals, and, among the elderly, more 60% of the population group (SCALA et al., 2015). In addition, between genders, the prevalence was 35.8% in Brazilian men and 30% in women, similar to that of other countries. (BRANDÃO et al., 2010)

According to the Ministry of Health's 2006 book on systemic arterial hypertension, Systemic Arterial Hypertension was considered a serious public health problem in the country and in the world, being a risk factor for developing cardiovascular, cerebrovascular and renal diseases, in addition to being combined with the diagnosis of diabetes, leads to 50% of end-stage renal failure.

SAH predicts a huge expense arising from the public coffers for the health system in the face of hospitalizations and use of health services, in addition to being indirectly related to the loss of quality of life and work of the individual, thus being related to social security and the loss of productivity. In 2018, they attributed a cost of around BRL 2 billion in the Unified Health System per year, due to SAH alone (NILSON et al., 2020). In addition, SAH is one of the diseases that would best benefit the population, especially those over 60 years of age, with an active life expectancy, if it were eliminated (CAMPOLINA et al., 2013).

Adherence to drug treatment is fundamental as part of the adequate control of SAH in the affected population, however

it constitutes the major cause of failure in the control of this cardiovascular disease (ORGANIZAÇÃO MUNDIAL DA SAÚDE, 2003). The asymptomatic pattern of the disease causes patients to underestimate the severity of SAH, abandoning the continuous and correct use of medication and the healthy lifestyle measures recommended for these individuals, since these measures significantly reduce the complications caused by the disease. Alongside this idea, it is evident that treatment abandonment due to partial normalization of blood pressure is very common (DUARTE et al., 2010).

With the high number of hypertensive people, therefore, it is essential that the nation seeks innovative and beneficial ways to prevent the possible aggravations of this disease, especially in public health, which all city dwellers depend on. A contemporary option is the daily and complete BP telemonitoring of these individuals. This way, some possible benefits such as improving the quality of life of citizens, promoting preventive health, contributing to the management of chronic diseases and, finally, a considerable reduction in government spending on health, can be achieved.

BLOOD PRESSURE MONITORING BY THE UNIQUE HEALTH SYSTEM (SUS)

During the 1980s, health indicators were surveyed that proved the effectiveness of the municipalization movement, such as the programs carried out to control hypertension and its consequences and also polio, measles, respiratory infectious diseases, among others. Such research was important to materially and scientifically prove the theses that were addressed and defended during the 8th National Health Conference in 1986, at the National Health Reform Commission in 1987 and at the National Constituent Assembly

in 1988, resulting in progress which were manifested in the creation of the Unified Health System (SUS) with the creation of laws 8080 and 8142/1990. (SANTOS, 2018)

In 1986, the Ministry of Health's National Division of Chronic-Degenerative Diseases launched the document "Strategic and Operational Basis for the Control of Cardiovascular Diseases (CVD)". This document brought an approach to problems focused on risk and, with the aim of preventing these diseases, it used anti-smoking campaigns and campaigns in favor of the habit of practicing physical exercises together with adequate nutrition, known as the "population strategy". While prevention through the "high-risk strategy" would occur through the follow-up of high-risk patients by doctors specialized in the care of hypertensive patients, with detection and control of the main risk factors, such as smoking habits, obesity and hypercholesterolemia (ASSIS et al. al, 2012).

In addition, the Ministry of Health, in 2001, proposed the Plan for the Reorganization of Attention to Systemic Arterial Hypertension and Diabetes Mellitus, through the System for Registration and Monitoring of Hypertensive and Diabetic Patients (HIPERDIA). This program has enabled a continuous and far-reaching service to this day, which creates a link between patient and health professional through prevention, treatment and monitoring of the referred disease (ASSIS et al, 2012).

MONITORING OF ARTERIAL HYPERTENSION

Out-of-office blood pressure monitoring is already a practice used in several countries in order to assess fluctuations in this vital sign over a given period. Ambulatory Blood Pressure Monitoring (ABPM) or Home Blood Pressure Monitoring (HBPM) is generally used. Both bring several advantages, such as estimating

a greater number of measurements, assessing pressure during patients' usual activities and, in addition, it has the capacity to identify masked arterial hypertension. However, these forms of BP assessment also bring with them some important disadvantages: the availability of ABPM is sometimes limited, there is also the fact that it is cost-effective and risks being uncomfortable for the patient; in HBPM, as the analysis of systemic blood pressure requires the patient to remain at rest, there is a greater potential for error in measurement and, in addition, this method does not have nighttime readings. (BARROSO et al., 2021)

Blood Pressure Telemonitoring (TPA), in turn, allows for remote BP tracking and stricter and more efficient monitoring of patients' health status. The benefits of this type of preventive treatment are even better when associated with a multidisciplinary team (doctors, nurses and pharmacists, for example). (OMBONI et al., 2016)

BLOOD PRESSURE TELEMONITORING (TPA)

In order to analyze the applicability of the use of TPA, the access and availability of hypertensive patients to this model of care must be evaluated. In a study carried out in Singapore, 52.5% of patients who had never used telemonitoring would be willing to use this modality. In addition, smartphone and cell phone ownership and computer skills were associated with greater propensity to use TPA. However, patients who reserved more time for face-to-face visits and those concerned about privacy violations were more resistant to adhering to telemonitoring. Finally, when the effectiveness of this care model is evidenced, the willingness to adhere increases. (SIN et al., 2020).

In another study, it was shown that app-based ADT, in the first months, improves blood pressure and adherence to treatments;

there is no evidence that the beneficial effects are sustained over longer periods of time. In addition, artificial intelligence can be used to help manage, interpret and use data collected from the patient. Still, the recurring concern about data privacy can be mitigated by using the *blockchain* system, which uses an encrypted and decentralized database, which conditions a network with high data integrity. (OMBONI et al., 2016)

ADVANTAGES X DISADVANTAGES OF TELEMONITORING BY DIFFERENT FACTORS

Hypertensive telemonitoring (TPA) brings with it a series of challenges. Among them, it must be noted that the transition from the conventional method to the new models, in practice, requires substantial adaptability and training of professionals, patients and caregivers. In this sense, it is worth noting that many adults and elderly people have difficulty handling and connecting technological devices, some are still resistant to using such resources, because they feel distrustful or uncomfortable when interacting virtually. In addition, socioeconomic and geographic aspects, especially in remote areas, can be a difficult means for the establishment of new modalities. Therefore, for TPA to consolidate, it is essential that, in addition to technological availability and quality, patients are willing and able to take on a leading role in self-care. (SACHETT, 2020)

However, it must be considered that telemedicine solutions can help to create and establish a lasting and efficient relationship between the doctor and the patient, facilitating the control of blood pressure and vascular risk, an essential characteristic in the case of hypertension, in which the patient needs continuous medical follow-up throughout his life. In addition, it is worth noting that the TPA allows health professionals to expand their

reach, beyond the service units, to provide a follow-up service to a greater number of patients, with great time savings and with the same quality as traditional consultations, (OMBONI et al., 2020)

In addition, it must be noted that for the diagnosis of hypertension, the physician needs to monitor the patient's blood pressure levels several times in primary care units. Due to the difficulty in acquiring correct values, it is believed that one third and a half of patients are underdiagnosed. Thus, it becomes clear that the use of technologies that help in measuring blood pressure without professional assistance, allows for a more accurate assessment and diagnosis, in addition to facilitating the control of blood pressure levels in patients who have already been diagnosed. Another point to be discussed is that, low therapeutic adherence determines a lower efficiency of the drugs, consequently, it increases the morbidities of the clinical conditions of the patients and leads to unnecessary hospitalizations that could be avoided, which generates social and economic impact. Therefore, remote monitoring mechanisms would allow the physician to interfere and improve the patient's engagement with the treatment, guaranteeing the patient's quality of life. (KITT et al., 2019)

Advantages and Potential (CASTRO et al., 2020)

- Strengthens the identity and bond between the health team, patients and their families.
- Improve management by integrating the team and health services.

Disadvantages and Challenges (CASTRO et al., 2020) (DA COSTA et al., 2021)

- Expansion of the workload of professionals.
- Build an integrated care network.
- Remote environments have specific regulations to ensure patient safety.

- Possible technology-related barriers, such as access or handling by some patients.
 - Staff training.
 - Need for improvement and safe storage of information.
- from urban centers.

TREND FOR THE FUTURE

Telemonitoring shows promise for approaching and managing diseases, not being limited to this alone, but in the individual as a whole, especially in those at risk (DA COSTA et al., 2021).

With the pandemic caused by the new coronavirus, and the need for social distancing, combined with technological advances, it allowed research on telemonitoring to be leveraged, especially for groups with chronic diseases, such as hypertension (DA COSTA et al., 2021).

CONCLUSIONS

Presence of BP telemonitoring is one of the main forms of application of telemedicine, being extremely important for the management and control of SAH, a disease that accounts for 50% of deaths caused by vascular and heart diseases, according to the Brazilian Association of Cardiology. The importance of this monitoring method is due to the greater efficiency of tracking and the convenience offered, especially when there are associations of multidisciplinary teams.

Furthermore, studies show that when using applications for TPA, in addition to improving the rate of AP, it contributes to greater adherence to treatments. However, this method still faces some obstacles, such as: the lack of professional training - due to the maintenance of traditionalism in the medical environment - and the heterogeneity of scope, since the technology depends on several external factors, making it difficult for these technologies to reach places more isolated

REFERENCES

- ASSIS, Luana Couto; DA SILVA SIMÕES, Mônica Oliveira; CAVALCANTI, Alessandro Leite. Políticas públicas para monitoramento de hipertensos e diabéticos na atenção básica, Brasil. *Revista Brasileira de Pesquisa em Saúde/Brazilian Journal of Health Research*, v. 14, n. 2, 2012.
- BARROSO, Weimar Kunz Sebba et al. **Diretrizes brasileiras de hipertensão arterial–2020**. *Arquivos brasileiros de cardiologia*, v. 116, p. 516-658, 2021.
- BRANDÃO, Andréa A. et al. **Conceituação, epidemiologia e prevenção primária**. *Brazilian Journal of Nephrology*, v. 32, p. 1-4, 2010.
- CAMPOLINA, Alessandro Gonçalves et al. **A transição de saúde e as mudanças na expectativa de vida saudável da população idosa: possíveis impactos da prevenção de doenças crônicas**. *Cadernos de Saúde Pública*, v. 29, p. 1217-1229, 2013.
- CASTRO, Andrea Augusta et al. **Teleconsulta no Contexto da Covid-19: Experiência de uma Equipe em Cuidados Paliativos**. *Revista Brasileira de Educação Médica*, v. 44, 2020.
- DA COSTA, Kalliza Kary Rodrigues; DA SILVA CORREIA, Dayse Mary. **A relevância do Telemonitoramento para hipertensos: uma revisão integrativa** The relevance of Telemonitoring for hypertensive patients: an integrative review. *Cep*, v. 22790, p. 669, 2021.
- DUARTE, Marli Teresinha Cassamassimo et al. Motivos do abandono do seguimento médico no cuidado a portadores de hipertensão arterial: a perspectiva do sujeito. *Ciência & Saúde Coletiva*, v. 15, n. 5, p. 2603-2610, 2010.
- INTROCASO, Luiz. **História da medida da pressão arterial**. *Dados Internacionais de Catalogação na Publicação (CIP) (Câmara Brasileira do Livro, SP, Brasil)*, p. 5, 1998.
- KITT, Jamie et al. **Novas abordagens no tratamento da hipertensão: uma revisão das tecnologias atuais e em desenvolvimento e seu impacto potencial no tratamento da hipertensão**. *Relatórios atuais de hipertensão*, v. 21, p. 1-8, 2019.
- MAGALHÃES, Maria Eliane Campos et al. **Prevenção da hipertensão arterial: para quem e quando começar**. *Rev Bras Hipertens*, v. 17, n. 2, p. 93-97, 2010.
- MALACHIAS, M. et al. Sociedade Brasileira de Cardiologia. **7ª Diretriz Brasileira de Hipertensão Arterial**. *Arquivo Brasileiro de Cardiologia*, v. 107, n. 3 Supl, p. 1-103, 2016.
- NILSON, Eduardo Augusto Fernandes *et al.* **Custos atribuíveis a obesidade, hipertensão e diabetes no Sistema Único de Saúde**, Brasil, 2018. *Revista Panamericana de Salud Pública*, v. 44, p. e32, 2020.
- OMBONI, Stefano *et al.* **Telemedicina e M-Health no tratamento da hipertensão: tecnologias, aplicações e evidências clínicas**. *National Library of Medicine*, [s. l.], 22 abr. 2016. DOI 10.1007/s40292-016-0143-6. Disponível em: <https://pubmed.ncbi.nlm.nih.gov/27072129/>. Acesso em: 29 mar. 2023
- OMBONI, Stefano *et al.* **Saúde eletrônica no controle da hipertensão: uma visão sobre o papel atual e futuro do telemonitoramento da pressão arterial**. *National Library of Medicine*, [s. l.], 6 jun. 2020. DOI 10.1007/s11906-020-01056-y. Disponível em: <https://pubmed.ncbi.nlm.nih.gov/32506273/>. Acesso em: 29 mar. 2023.
- ORGANIZAÇÃO MUNDIAL DA SAÚDE. **ADHERENCE TO LONG-TERM THERAPIES: Evidence for action**. WHO Library, [s. l.], 2003. Disponível em: <https://apps.who.int/iris/bitstream/handle/10665/42682/9241545992.pdf?sequence=1&isAllowed=y>. Acesso em: 29 mar. 2023.
- PAULA, Antonio da Cruz *et al.* **Telemonitoramento e a dinâmica empresarial em saúde: desafios e oportunidades para o SUS**. *Revista de Saúde Pública*, [s. l.], 2020. DOI <https://doi.org/10.11606/s1518-8787.2020054001996>. Disponível em: <https://www.scielo.br/rj/rsp/a/WzcMD7NTfbWhTjPRsKn8MTh/?lang=pt&format=pdf>. Acesso em: 29 mar. 2023.
- SACHETT, Jacqueline de Almeida Gonçalves. **Adaptação para o atendimento profissional de saúde em tempos de COVID-19: contribuições da tele saúde para o “novo normal”/Adaptation for professional health care in times of COVID-19: contributions from telehealth to the “new normal”/Adaptación para la asistencia sanitaria profesional en tiempos del COVID-19: contribuciones de la tele salud a la “nueva normalidad”**. *Journal Health NPEPS*, v. 5, n. 2, 2020.

SANTOS, Nelson Rodrigues dos. **SUS 30 anos: o início, a caminhada e o rumo**. Ciência & Saúde Coletiva, v. 23, p. 1729-1736, 2018.

SCALA, Luiz Cesar Nazario *et al.* **Epidemiologia da hipertensão arterial sistêmica**. Sociedade Brasileira de Cardiologia. Livro Texto da Sociedade Brasileira de Cardiologia. 2015.

SIN, David Yang Ern *et al.* **Avaliação da disposição para intervenções de telemonitoramento em pacientes com diabetes tipo 2 e/ou hipertensão no ambiente público de atenção primária**. National Library of Medicine, [S. l.], p. 20: 1-11, 28 jan. 2020. DOI 10.1186/s12911-020-1024-4. Disponível em: <https://pubmed.ncbi.nlm.nih.gov/31992288/>. Acesso em: 29 mar. 2023.