Patient Preference and Adherence

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ORIGINAL RESEARCH

Adherence to Pharmacological Therapy for Hypertension in Portugal: Insights from Patients' Focus Groups

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Purpose: Medication adherence is crucial for blood pressure control. Knowledge of medication adherence and its influencing factors, particularly within cultural and healthcare contexts, is essential for developing effective strategies to enhance medication adherence. Qualitative studies have explored patients' perspectives globally. Few have focused on strategies to improve adherence, and such research is lacking in Portugal. This study aimed to gather the perspectives of Portuguese patients with Arterial Hypertension (HTN) concerning the most effective strategies to enhance adherence to antihypertensive medication and to understand its contributing factors.

Methods: We conducted qualitative research through online focus groups of four to ten participants each. Participants were adult patients with HTN taking at least one antihypertensive drug from the primary care setting. The number of focus groups was achieved through theoretical saturation. Purposive sampling was used, with patients recruited through their family doctors. Participants were recruited from all seven Portuguese regions, representing both sexes, controlled and uncontrolled HTN, and a diverse range of educational levels, employment statuses, living arrangements, and socioeconomic statuses. Meetings were audio-recorded and transcribed. Two researchers conducted content analyses using MAXQDA 2023 through comparative analyses and consensus. Results are presented narratively.

Results: Four focus groups were conducted. Findings reported patients' strategies to improve adherence to pharmacological therapy for HTN. These included changes to medication and blister packs, such as a color-coded system. Other strategies involved reducing medication costs and making specific suggestions for primary healthcare. Patients additionally proposed psychological support and technological aids. Barriers such as difficulties in accepting medication and facilitators, such as fears of complications associated with HTN, were also identified.

Conclusion: These results highlight the multifaceted perspectives of Portuguese patients with HTN and emphasise the role of technology, family support, and primary health services in promoting adherence. Such insights should be incorporated when addressing medication adherence in HTN.

Keywords: medication adherence, arterial hypertension, focus group, qualitative research, primary healthcare

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Introduction

Arterial Hypertension (HTN) is a public health problem and is the most important and preventable risk factor for cardiovascular disease (CVD).[1] Uncontrolled HTN is strongly associated with premature deaths,[2] and high systolic blood pressure is a leading risk factor for disability-adjusted life years (DALYs) lost.[3]

The prevalence of HTN is increasing,[4] with global population growth and ageing as the main factors.[5] HTN is estimated to affect approximately 33% of adults aged 30–79 years globally, with only 21% of these patients having it controlled.[2] In Portugal, the prevalence of HTN among adults aged 25–74 years is 36%,[6] with control rates varying between 42.5% and 71.3%.[6–8]

Uncontrolled HTN is correlated with a higher risk of complications,[9] and medication adherence plays a critical role in blood pressure control.[10]

In Portugal, research on the prevalence of medication adherence in HTN medication is limited, primarily based on small-scale studies or restricted to specific geographic areas.[11–22] Some studies even used assessment scales without validated cut-off points[23] for adherence or instruments that had not been formally validated, while others relied on alternative methods to assess adherence.[11] Within this heterogeneous body of research, reported non-adherence rates reach 58.4%.[24]

Non-adherence to antihypertensive medication is associated with higher blood pressure, increased risk of poor control, complications, hospitalisation, mortality.[25] It is also linked to greater healthcare resource utilisation and costs,[26] yet few studies in Portugal have addressed this issue.[27]

Randomized controlled trials have been developed to increase MA, but wider, more effective interventions are still needed.[28,29]

Knowledge of medication adherence and its influencing factors must be analyzed within the context of each population, society and unique healthcare system.[30,31] Barriers and strategies are likely to differ across settings, requiring context-specific understanding.[31] These data may be helpful in planning strategies to improve medication adherence and patient care in each location.[31,32]

Adherence programs should be tailored to patients' preferences, especially when they do not fully follow their primary care physicians' recommendations.[10,16] This emphasizes the importance of collecting patients' perspectives to develop solutions that enhance medication adherence. Gathering patients' opinions on the barriers to medication adherence is also vital, as modifying interventions to address these barriers can boost adherence.[13,17]

Qualitative studies addressing patients' perspectives on antihypertensive medication adherence have been previously published worldwide,[33] with some incorporating focus group methodology.[34,35]

In Portugal, there is a lack of qualitative studies in this area. To date, only our pilot study[36] and a qualitative study exploring healthcare professionals' views,[37] both developed within this research line, have been conducted. The pilot study confirmed the feasibility of the present research, validated the discussion script, and provided preliminary insights into patients' opinions.[36] The study with healthcare professionals included nurses, family physicians and community pharmacists, who are directly involved in the care of patients with HTN and possess detailed knowledge of healthcare delivery and available resources to support adherence.[37]

No studies have specifically addressed medication adherence in adults with HTN or patients' suggestions for overcoming its barriers.

Focus groups were chosen as they enable in-depth exploration of participants' views, with interaction between participants fostering richer discussions and the emergence of new ideas.[38]

Objectives

The primary objective of this study was to investigate the perspectives of Portuguese patients with HTN regarding the most effective strategies for enhancing medication adherence.

A deep understanding of the factors contributing to adherence to antihypertensive medication was also sought.

Methods

The methodology employed in this study was detailed in the previously published protocol.[39]

Qualitative research was conducted through synchronous online focus groups to allow for a more inclusive sample of participants from different geographical locations and a wider range of views, which would be difficult to reach and less cost-efficient through other methods. The focus groups had a maximum duration of 1.5 hours each, comprising four to ten participants each. The number of focus groups was determined for theoretical saturation, where no new themes emerged.[40]

Meetings followed a guide (Supplementary Material) and Zoom (version 5.15.3) was selected as the conference platform.

The main moderator was (BR) MD, who conducted the meeting. Two assistant moderators, (IR) PhD and (DV) MD, solved technical problems and produced a meeting summary. BR and IR, both female, are General Practitioner/Family Medicine (GP/FM) physicians, researchers, and trained focus group moderators. DV (male), a medical student, received focus group training and instructions from BR and IR to report a summary at the end of each meeting.

Through informed consent and a flyer (Supplementary Material), selected participants were briefed on the research team, study objectives, study design, focus group dates, and the meeting platform. To facilitate adherence to the study, four optional dates, each at a different time of the day, were given to confirmed participants. Each participant received a reminder (via e-mail or telephone) immediately before the meeting.

The principles of qualitative research design for focus groups were considered using the criteria and standards of quality and transparency: COREQ[41] and Standards for Reporting Qualitative Research.[42]

Selection of Participants

Participants were recruited using purposive sampling in July 2023. Family physicians addressed potential participants during consultations, via e-mail or telephone, to discuss their willingness to participate. Physicians also informed them about the need and possibility of assistance from any family member or caregiver to handle the technological requirements of the meeting. Written informed consent was obtained from the patients by the family physicians before the patients' contact with the research team.

The focus groups included adult patients with HTN who were taking at least one antihypertensive drug from the primary care setting. The nomination of potential patients included the criteria defined in the protocol, and the Portuguese regions followed the Nomenclature Units of Territory for Statistical Purposes (NUTS) 2013 (North, Centre, Lisbon Metropolitan Area, Alentejo, Algarve, and Autonomous Regions of Azores and Madeira).[43]

Participants provided written informed consent to use their data, opinions, and audio-recordings. There was no payment for participants to join the study.

Data Collection

Data were collected during the focus groups and recorded via Zoom (version 5.15.3) in July 2023. The moderator (BR) introduced the script questions (Supplementary Material), promoted the discussion, and remained neutral while ensuring an interactive environment.

At the end of the meeting, participants had the opportunity to report on a previous or non-discussed topic they considered relevant to the study and were encouraged to share their opinions regarding the summary content.

Transcripts of the data were not returned to participants due to their extensive nature and because they could potentially infringe on the confidentiality of other participants.

After conducting the focus group discussions, participants were asked to complete an online form to provide supplementary demographic data.

Data Analysis

The acquired data were subjected to a qualitative content analysis using MAXQDA 2023 (version 24.0.0)[44,45] between November and December 2023.

Two researchers (BR and DV) developed a coding tree with categories based on the identified primary themes and sub-categories through continuous comparative analyses and subsequent consensus. Initially, category definitions and abstraction levels were established, and deductive and inductive approaches to category development were employed. A third investigator (IR) reviewed the analyses. The coding tree was intentionally designed to closely align with the discussion guide, ensuring consistency with the study objectives and facilitating a structured approach to data analysis.

The results were presented narratively in tables, accompanied by illustrative quotations that did not reveal any characteristics of participant identity to ensure confidentiality. Results were compared with the 15 most relevant strategies identified after reviewing the transcripts.

Participants did not provide direct feedback on the findings.

Patient and Public Involvement

- Patients in the focus group shared their views, experiences, perspectives, and ideas during the meetings.
- Other patients helped recruit focus group participants by addressing their relatives.
- Two non-participants attended the meeting to provide technological aid to their relatives.

Results

The focus groups included 11 female and 11 male patients aged 38–90 years with a mean age of 61.3 ± 15.4 years. Three of the focus groups consisted of six participants, while one group comprised four participants.

Seven patients who accepted the invitation did not participate due to organizational difficulties. Participants were from all seven Portuguese regions according to NUTS 2013,[43] including the Portuguese Autonomous Regions Madeira (n=3) and Azores (n=1). Five participants only had primary education, eight had secondary education, and nine had higher than secondary education. All participants perceived their blood pressure to be controlled, and three participants (13.6%) had an incorrect perception of their blood pressure control. None of the participants had previously participated in a similar study.

Participants' characteristics are reported in Table 1.

Table 1 Participants' Characteristics

Variables		**n=22**	**%**
Gender	Female	11	50
	Male	11	50
Area of Residence	North	3	13.6
	Centre	7	31.8
	Lisbon Metropolitan Area	4	18.2
	Alentejo	2	9.1
	Algarve	2	9.1
	Autonomous Regions of Azores	1	4.6
	Autonomous Regions of Madeira	3	13.6
Housing Area	Urban	16	72.7
	Rural	6	27.3
Living arrangement	Alone	4	18.2
	Shared Living Arrangement	18	81.8
Education Degrees	Primary Education	5	22.7
	Secondary Education	8	36.4
	Higher Education	9	40.9

(*Continued*)

Table 1 (Continued).

Variables		n=22	%
Working Status	Retired Working Unemployed	10 11 1	45.5 50 4.6
Socioeconomic Status	Unknown Low Middle High	1 0 20 1	4.6 0 90.9 4.6
Diagnosis of HTN (years)	≤5 5-10 >10	6 6 10	27.3 27.3 45.5
Control of HTN as Reported by Family Physician	Controlled Uncontrolled	19 3	86.4 13.6

Meaning of HTN and Side Effects of Antihypertensive Medication

Participants stated that it was challenging to explain the meaning of HTN, but recognized it was determined by cutoff values (Table 2). Patients had some knowledge about the pathophysiology and complications of HTN. Regarding the signs and symptoms of HTN, some reported feeling asymptomatic, while others reported headaches and dizziness. Stress and heritability were some modifiable and non-modifiable risk factors identified. Participants also recognized the need for antihypertensive medication, with some stating the occurrence of side effects (Table 2).

Table 2 Meaning of HTN, Side Effects, and Strategies to Mitigate Side Effects

Definition	"I do not know how to explain my point very well." "HTN, in my point of view, is more of a point of maybe a constant recurrent elevated arterial tension." "For the common citizen, it is higher than 140/80 mmHg for most people."
Physiopathology Explanation	"Pressure exerted by the blood in the veins and arteries, direct from the heart." "It works like a water hose, right? (…) The hose is under pressure from the water."
Signs and Symptoms	"I mean, mentally, at least for me, there is something that feels dizzy." "I felt a headache or discomfort." "For me, it is tiredness." "I felt tachyarrhythmias. The heart was beating a lot." "Feel anything different? I do not think so. No, there are no differences at all."
Complications	"HTN can lead us to have strokes." "I was like: My arm stopped moving! What should I do? I had to go to the hospital and go to the emergency department, where my BP was lowered. Since then, I started to take medication." "(…) When I had my first child, I immediately had problems with HTN. I had pre-term labor."
Risk Factors	"It is linked with all CVD, and in my case, I have parents with HTN." "It is associated with a sedentary lifestyle and unhealthy eating habits." "Stress and anxiety also elevate BP." "If I am going out, and things do not go as planned, my BP elevates."
Medication Recognition	"The medication prescribed to us (…) is fundamental, as are the established schedules."

(*Continued*)

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Table 2 (Continued).

Side Effects	"So far, I have not noticed any side effects." "I have noticed that my sexual life got harder, (…), went from being a champion to having a preoccupation I had never had." "I do. Sudden movements get me dizzy." "There are times when tension drops a lot." "I am allergic to ACEIs, and I did not know about it. I was treated and ended up in the hospital, all swollen."
Strategies to Mitigate Side Effects	
Medication adjustments	"Reduce the dose of medication to reduce hypotension." "Try to adjust sometimes, when you have several medications, to try to reduce interactions."
Increase knowledge	"When I was prescribed the medication for the first time, the possible side effects were explained to me."
Innovation in medication	"We are always awaiting something better and more efficient for our health, are we not? That brings us the quality of life again. It is part of the evolution of science."

Abbreviations: BP, blood pressure; CVD, cardiovascular disease; HTN, Arterial Hypertension; mmHg, millimeters of mercury; ACEIs, angiotensin-converting enzyme inhibitors.

Strategies to Mitigate Side Effects

To mitigate side effects, patients suggested medication adjustments, like dose reduction to minimize hypotension, and improving knowledge about side effects through doctor-patient communication. Medication innovation was believed to mitigate side effects. (Table 2).

Barriers to Pharmacological Adherence in HTN

Unacceptance of the need for HTN medication was a common barrier. Patients expressed feelings of medication dislike and the inability to adapt their daily lives to the medication intake. Nevertheless, some patients eventually came to accept it. Participants also wondered whether medication should be stopped under certain circumstances, which could result in missing doses. (Table 3).

Table 3 Barriers, Facilitators, and Strategies Used to Improve Pharmacological Adherence in HTN

Barriers	
Difficulty Understanding Whether to Stop the Medication	"The other day, I did not take it. I was afraid because I had a Somersby®, and I was concerned that it might interact negatively because I have that doubt, and I still have not asked the physician. Maybe it is better not to take it so that I can have a Somersby®. Then I thought: What if? Because if I take it and have a drink, what could happen? I still have that doubt." "We have a medical exam to do. Is it better to suspend medication to take that exam? Maybe that is the best course of action. I do not know."
Difficulty Accepting Medication	"At the beginning, I did not want the medication." "Sometimes I do not like the idea of taking medication, but it has to be. I already realised it has to be, and I always take it." "I am still searching for the best way to adapt to the medication and change my lifestyle."
Only When It Feels Necessary	"To be honest, (…), I do not always take it. I only take it when I feel I have more need for it. There are periods when I feel okay, so I stop taking it."
Preference for Alternative Medicines	"I would rather use homeopathic medication." "In the last ten or 15 years, I have increasingly doubted conventional medicine. I am searching for other ways to fight disease."

(*Continued*)

Table 3 (Continued).

Medication Cost	"The cost is currently very high, (…) in chronic diseases, the cost accumulates over time."	
Forgetfulness	Routine/ Change of routine	"You know the daily rhythm, the madness of the days." "Especially on weekends when the rhythm of life and the schedule are different." "When I am outside home for longer periods, having any meal outside, having lunch, or something like that, if I do not bring the box, I forget."
	Uncertainty about medication intake	"I'm unsure whether I've already taken it or not, and in that case, I end up not taking it." "Throughout the day, with lots of things to do, I do not know if I took it or not."
	Lack of Medication	"Essentially, when I run out of the medication and do not purchase it in advance, it can lead to a gap of two to three days until I acquire a new package. (…) Forgetfulness is primarily attributed to the depletion of stock rather than any other factor."
	"Silent" Disease	"I have forgotten to take my medication several times. To be honest, I did not feel any difference. But when I remembered that I had forgotten to take it for two to three days. I promptly took it."
	Adaptation Phase	"I already forgot, and since I've only been taking it for a short time, I am not used to it."
Facilitators		
Intrinsic Patient Characteristics	"I think one important factor in taking the medication is to like ourselves." "We have to assume responsibility." "It was a difficult adjustment, and I learned to manage stress differently. I started to switch off mentally. I do this with medication, too. I only focus on medications during the intake phase. The rest of the time, I tend to forget about them."	
Fear of Complications	"I've had such a bad time with my blood pressure being so high, (…). Both my father and mother experienced strokes and other similar issues. I just want to ensure I take everything correctly to see if the same does not happen to me." "By the time I got to the office, my BP was almost 220. I got scared, and from then on, I take a pill every day."	
Perception of Benefits	"Since I began taking medication for blood pressure, I've noticed I'm calmer, which not only helps me but also keeps blood pressure regulated." "If we have scientific assurance that medication will truly help, I think it is a factor that leads us to take medication consistently."	
Physician Interventions	"My physician scared me a bit, mainly about blood pressure. Now I never miss a dose." "He scolded me because he noticed that I was not picking up the boxes he had prescribed." "I received treatment from the cardiologist, who explained to me that I had to take them." "If we ask our family doctor or look into the prescription, it is always there, the formula, the number of times, and how to take it."	
Strategies Used		
Pill organizers	"I do not know if I took it, so I look at the box, and if it's empty. I have already taken it. It is easier." "I have a weekly pill organizer box (…) and keep track of what is there and what I have already taken." "Small boxes that divide the medicines into compartments are useful, but only if we bring them with us."	
Reminders	"When the alarm rings, it is time to take the medication." "When there are changes in my medication, I set alarm clocks every day. The time comes, and it rings."	

(*Continued*)

Table 3 (Continued).

Routines	"Just leave it in a place where you regularly go during your routine." "I have already established a routine. Taking the medication is the first thing in the morning. It's a glass of water and the medicine."
Have a backup	"I always take them because I always have some spares in my wallet." "We have to keep one [medicine] stored somewhere so that we can take it if we forget to take it at home."

Abbreviation: HTN, Arterial Hypertension.

Medication costs were considered high, especially when combined with expenses from other chronic diseases and their medication expenses.

Participants reported several causes of forgetfulness, including changes in daily routine, weekends, and eating meals outside the home.

In addition, participants expressed that the fear of double-dosing and forgetting to resupply the medication was also a reason for missing the medication. Furthermore, the asymptomatic nature of HTN was described as a reason for forgetting to take the medication. One participant reported occasional forgetfulness after the initiation phase[46] and made some omissions until the medication became part of daily life.

Facilitators of Pharmacological Adherence in HTN

Assuming accountability and wanting for one's well-being were perceived as facilitators of pharmacological adherence in HTN. Coping mechanisms, including the strategy of focusing on medication only at the time of intake, were also described as supportive of medication adherence.

Fear of major complications related to HTN, such as strokes, was associated with better adherence to antihypertensive medication.

Perceiving the beneficial effects of medication was said to facilitate adherence to antihypertensive medication, either directly through symptomatic relief or indirectly through belief.

Participants also valued GPs/FMs explaining or writing the dosage schedule, motivating adherence, and explaining the possible consequences of poor adherence.

Strategies Used to Improve Pharmacological Adherence in HTN

Participants reported pill organizers, reminders, integration into their daily routine, and always having medication with them as strategies used to enhance pharmacological adherence in HTN (Table 3).

Role of Technology and Family in Antihypertensive Medication Adherence

Technology was seen as both a facilitator and a barrier, as it improves communication with healthcare providers but is not accessible to all and may spread misinformation (Table 4). The use of technology as a reminder, such as an alarm, is described in Table 3.

Families were described as important motivators, helping by collecting medicines or organizing them into labelled containers, so patients associate each medication with the same container and disease. Even those who lived alone believed that family helped to improve adherence. One participant stated that medication adherence is the participant's responsibility, whether living with or without family (Table 4).

Role of Primary Care and Pharmacies in Antihypertensive Medication Adherence

Participants expressed positive attitudes towards Primary Healthcare (PHC), reporting ease in scheduling appointments and renewing prescriptions. Furthermore, some reported having their BP regularly monitored by a nurse at the PHC, who also educated them on the importance of medication adherence. Physician interventions are reported as facilitators in Table 3.

Table 4 Role of Technology, Family and Primary Healthcare, Pharmacies

Technology	
Facilitates Healthcare Communication	"I already have it here on my phone to go to the pharmacy and say that I need this medicine. So, it's some help too." "We can now receive lab results by e-mail." "If I feel unwell or if I need anything, I can call her and exchange e-mails directly with her [family doctor]."
Disadvantages	"There are people who have HTN with more and less digital skills. We must help both. Some probably do not even have a smartphone. Others have a telephone and barely know how to use it." "It can also bring complications because we will conduct searches and sometimes find opposing opinions, right? Instead of learning something, we are left without knowing what we should believe." "The prescriptions are available on the national healthcare [app]. The app tells us how many prescriptions are valid and how many pill boxes we can pick up. I have missed a lot of doses because the prescription [in paper] did not have the number of pill boxes available, and sometimes I thought I had it [medication], but I had not."
Family	
Reminders	"The husband/wife factor is a good reminder. (…) I also get scolded when I let the medication stock run out." "The family does almost like a silent patrol. They pass through the box, look at it, and ask: Have you taken your medicines, Mother?"
Motivates	"The husband/wife factor is a good reminder. (…), I also get scolded when I let the medication stock run out." "The family does almost like a silent patrol. They pass through the box, look at it, and ask: Have you taken your medicines, Mother?"
Acceptance of medication	"They tell me: You must take them, Mother. And I know it, but I would rather not." "My husband is a nurse (…). He often reminds me: Have you taken your medication, or are you waiting for the pills in the box to fix your issue?"
Own responsibility	"[Help of the family] for what? I must take it. It is for my health." "People must have a head and know they must take it daily because it will give them years of life. I do not see pharmacies and health centers informing people that they must take this on time and daily. This is complicated."
Primary Healthcare and Pharmacies	
Support	"In our case, it [Primary Healthcare] works really well. Both in terms of quick response, in terms of scheduling an appointment, and medication." "I have been regularly monitored by a nurse. She regularly measures my blood pressure and educates me on the importance of taking the medication." [Primary Healthcare] "The pharmacist already helps a lot."
Pharmacies organize medication	"Pharmacies have pill organizers that are usually given for free." "They sell a pill organizer composed of four small compartments, which correspond to the morning, afternoon, or lunch time." "There are pharmacies that already prepare the daily medication in packets. They deliver at home with the medication separated for each day and each meal. I think it helps a lot, especially for older people or those with less literacy." "At the pharmacy, they give me a paper with how many boxes I have bought and how many I have left on the prescription, and the expiration date of the prescription." "My pharmacist puts a label with the name, purpose, and when to take it." "They encourage taking medication in a simple, very proactive way."

Pharmacies were recognized as facilitators of pharmacological adherence. Participants stated that some pharmacies were providing or selling pill organizers, preparing daily doses of medication in packets, home-delivering medications, informing about which medications were still available in the prescription receipt, labeling the medication boxes with the dosing schedule, and promoting the importance of medication adherence in health outcomes.

Strategies to Improve Adherence to Antihypertensive Medication

Direct adjustments to medication or its packaging were referred to facilitate adherence to antihypertensive medication. These measures comprised applying a chromatic code to antihypertensive pills to make them easily identifiable, using blisters with days labelled similarly to contraceptives, and reducing medication costs (Table 5).

Participants suggested additional initiatives, such as focus groups, as they perceived that this discussion had improved their knowledge of the topic.

Several technological suggestions were also made. These included digital apps that provide direct access to physicians' prescriptions and send reminders to patients, automated reminder calls, and the development of devices to improve disease and treatment monitoring.

Furthermore, regular telephone calls, better access to prescription details, weekly medication preparation by nurses, and volunteers as reminders at PHC centers could improve medication adherence.

Some participants proposed psychological support to motivate their medication adherence.

Table 5 Strategies to Improve Adherence to Antihypertensive Medication

Changes to Medication and Blisters	"Sometimes it's in one format, other times it is in another, and this is tremendously confusing. It would not be unreasonable if, perhaps, for medications treating the same symptoms, there were some sort of color-coded system." "They should take a cue from contraceptives. The blister pack indicates if it is Monday, Tuesday, and so on. [Antihypertensive] medication does not provide as much educational information."	
Reduction of the Medication Cost	"In chronic diseases, the cost of medication increases with time." "The price is currently too high."	
Initiatives such as Focus Groups	"A good example is what we are doing right now." "I really liked what we are doing here today (…), the fact that you are so young and have a genuine interest (…). I think your encouragement and provocation of thought is very good."	
Psychology	"Psychology. I think the government should provide support. As a teacher, I think it is important not only for kids but also for teachers. We deal with high levels of stress."	
Primary Healthcare Suggestions	"If there were no limitations, they could call every two months, asking: Have you been taking the medication? Do you need help? Is everything all right?" "A nurse to prepare weekly medication." "When I go to my family physician, she knows whether I've already lifted the boxes, but the patient is not aware." "Why not have volunteers within health centres, who could also promote this? We are always talking about reminders."	
Technology	Digital Apps	"The app would read the doctor's prescription, and the doctor himself loaded the information [the app] needed to give to the patient daily." "The app might notify Attention! You need to refill your blood pressure medication!" "Sometimes there are people who, when someone commands them, must resist. If it's an app, it's capable, but maybe it does not have resistance, because it doesn't have a face."
	Automated Calls	"Automated calls, pre-recorded calls, or other telephone strategies"
	Devices	"We are now seeing that these new watches we wear on our wrist already give us, (…), they already give value. They give an ECG or something like that, or pressure, or hear the pulse. In fact, and therefore, this will evolve." "If I make the parallel with the sensor on the diabetic's arm to know their blood glucose, one of these days we will have to. Even taking medication and knowing if you have it or not, and what you need to do for HTN." "We arrived home, and the medication would fall into our hands."

Abbreviation: HTN, Arterial Hypertension.

Discussion

Main Findings

By asking patients with HTN in focus groups about their perspectives regarding adherence to pharmacological therapy for HTN in Portugal, we identified essential strategies for improving adherence in primary care settings. A novel contribution of this study is that patients themselves proposed practical and creative solutions, some of which have not been previously reported in the literature.

Patients provided their solutions for addressing medication adherence in HTN. They suggested making them understand and fear the complications of HTN and raising awareness of the side effects of medication. They also recommended strategies to help them integrate medication into their daily routine, such as pill organizers and automated medication dispensers. Other suggestions included technological aids to remind them or allow them to track their available prescriptions, automatic calls, digital apps, and smartwatches to measure blood pressure. Some patients even imagined technologies that could detect whether medication had already been taken or make it appear instantaneously.

Family members or volunteers to help manage medication adherence, more accessible PHC, and broader access to medication preparation services with nurses implementing daily labelling and chromatic codes to avoid patient confusion, also emerged as solutions.

Participants recommended reducing medication expenses, integrating psychologists, and implementing focus groups in PHC.

Strengths and Limitations of this Study

A strength of these focus groups is gaining a deeper understanding of participants' motivations and beliefs compared to quantitative techniques.[47]

Another strength of this study is the inclusion of a diverse population representing all Portuguese regions according to the NUTS 2013,[43] as well as various ages, sexes, educational levels, employment statuses, and living arrangements. This diversity was achieved through online focus groups, which enabled a more cost-efficient study.

In this study, all dimensions of the World Health Organization (WHO) Multidimensional Adherence Model were reported,[48] unlike in most quantitative instruments used to assess factors influencing adherence.[31]

This study did not include participants from low socioeconomic backgrounds, although more than half of the Portuguese population falls into the middle class.[49]

By recruiting participants through family medicine physicians, we excluded patients not assigned to one.

Despite advice during the recruitment phase for individuals with less experience on online platforms to seek assistance from family, caregivers, or researchers, some participants experienced difficulties connecting online.

The moderator interacts daily with patients with HTN as a GP/FM and applies empathy during appointments, which creates a favorable atmosphere for participants to share.

To avoid social-desirability bias,[50] the moderator highlighted that there were no wrong answers and phrased the questions to make the participants feel accepted. To prevent proactive participants from dominating the discussion, the main moderator encouraged the more passive participants to intervene and attempted to remain neutral in tone and body language, thereby avoiding moderator bias and influencing opinions.[51,52]

The resulting strategies to improve adherence only reflect the views of patients from Portugal.

Discussion of Results and Comparison with Existing Literature

This study adds several novel contributions beyond prior literature on medication adherence in HTN. For the first time, Portuguese patients, embedded in their specific healthcare and social context, shared their perspectives, which had not been previously explored in any qualitative studies. The study also identified patients' expectations of innovative medications without side effects, reflecting their hope in scientific progress. In addition, it also revealed intrinsic patient characteristics, such as accountability and effective coping mechanisms, as positive influences on medication adherence. Patients further described the fear of complications as a facilitator of adherence and suggested that focus groups themselves could be

a potential intervention to support medication adherence. Above all, these perspectives enable an understanding of which strategies described in the literature are considered applicable and relevant to the Portuguese context.

An Overview of barriers, facilitators and strategies for medication adherence in HTN found in this study is presented in Table 6.

Consistent with previous studies, these focus groups of patients reported the risk factors of HTN, underscored the effect of stress and anxiety[53–56] and emphasized awareness of HTN complications,[36,53–58] such as stroke, due to positive family history[55,56] or personal experiences. Additionally, patients expressed fear of complications,[36,53–56,58] and believed that antihypertensive medication could prevent them.

Our study showed that awareness of adverse effects[10,36] and medication adjustments[36,56] can reduce negative perceptions about medications and improve adherence, as suggested by other studies. Physicians play a pivotal role in notifying patients of possible adverse effects and adjusting medications as necessary.[56,59] However, some Portuguese health professionals are afraid that explaining side effects might have the opposite impact on adherence, as patients decide not to start the medication if they are aware of that possibility.[37] With the advancement of medication innovations, patients in our study expect fewer adverse effects in the future.[56,60]

Participants reported voluntary and involuntary medication omissions, either due to the absence of symptoms leading to forgetfulness or because they felt well and disbelieved medication was necessary during these periods.[34,53,55] Some studies have described that patients incorrectly perceive the absence of symptoms as therapeutic success.[37,53,54]

Like our participants, patients experience difficulty accepting treatment during the initiation phase, which is compliance and not adherence.[61]

Patients take time to integrate medication into their daily routine right after the initiation, making some omissions of medication while adapting to it, and this is already an implementation problem.[46,61] With time, patients tend to consider medication as part of their daily routine, and implementation problems such as forgetfulness on non-routine days, lack of medication at home or with them, and uncertainty about whether they took the medication arise. These findings are consistent with other studies.[34,36,53]

Table 6 Overview of Barriers, Facilitators and Strategies for Medication Adherence in HTN

Barriers	Facilitators	Strategies
Difficulty Understanding Whether to Stop the Medication	Intrinsic Patient Characteristics	Changes to Medication and Blisters (apply chromatic codification to antihypertensive pills so they are easily identifiable; blisters with the days on them)
Difficulty Accepting Medication	Fear of Complications	Reduction of the Medication Cost
Taking medication only when it feels necessary	Perception of Benefits	Initiatives such as Focus Groups
Preference for Alternative Medicines	Physician Interventions	Psychology
Medication Cost	Family	Primary Healthcare Suggestions (regular phone calls to track medication adherence, nurse-led medication preparation, tools to enable patients to monitor their own medication, involvement of volunteers as reminders)
Forgetfulness	Primary Healthcare and Pharmacies	Technology (digital Apps, automated calls, devices)
Technology	Technology	Strategies to mitigate side effects: medication adjustments; increase knowledge; innovation in medication
	Strategies already used by patients: Pill organizers, Reminders, Routines, Have a backup	

Patients, as in other studies, showed a lack of knowledge about medication, which could lead to omissions,[53,55,57] for example, fear of interactions with alcoholic drinks or uncertainty about whether taking medication would interfere with the results of medical examinations, which can influence adherence.

Consistent with other studies, patients who expressed increasing disbelief in allopathic medicine seemed to be less adherent to antihypertensive medication.[55,58] Some participants reported searching for alternative forms of therapy, such as homeopathy or herbal treatments, as described by Portuguese health professionals[37] and in Asian studies.[58]

Patients, like healthcare professionals, also perceived medication cost as a barrier to antihypertensive medication adherence,[34,53,55,56,58] and suggested decreasing medication costs to improve adherence.

Intrinsic patient characteristics, such as assuming accountability and having effective coping mechanisms, were reported to positively impact adherence, for example, by reducing excessive worry about medication.

To the best of our knowledge, this is the first study to report this finding directly. In another study, personality traits such as conscientiousness were positively related to adherence.[62] Raising awareness about medication adherence for HTN and assisting individuals in coping with the emotions associated with taking these medicines may be subject to consideration in future studies.

Similar to other studies, patients' beliefs in the benefits of medication, either through knowledge[53,54] or symptomatic relief[55,56] were shown to improve antihypertensive medication adherence. In our research, the fear of complications was also highlighted as a facilitator of medication adherence. Empowerment is therefore essential in a silent disease like HTN, which our participants also noted.

Consistent with other studies, patients expressed appreciation for the family physician's willingness to explain the prescription, discuss the possible consequences of poor adherence, and motivate adherence.[34,39,55,56,58]

In response to the main problems reported during the implementation of adherence, patients employed strategies such as integrating medication into their daily routine, using pill organizers and reminders, and always carrying backup medication. These strategies have been reported in previous studies.[34,36,57]

Technology was perceived as a facilitator of adherence, as it improves communication with healthcare providers and provides reminders.[63] However, it is not easily accessible to everyone[64] and can also be a barrier when it leads to misinformation. These perspectives on technology have been previously documented.[36]

Patients expressed that their family members have an active role in helping in many ways, several of which are listed in the literature, including reminding,[34,36,55,58] motivating,[34] and playing a role in the medication preparation process.[36] In Portugal, changes to medication packages can lead to doubts about which medication the package corresponds to. Family members can help overcome this barrier by storing medications in labeled containers, as patients typically identify their medications by color and shape.[57]

Patients referred to PHC providers mainly as facilitators, as our patients reported being able to easily access PHC services, whether to schedule an appointment or renew a medication prescription. These findings are consistent with the literature, which describes easy access to healthcare as a facilitator[34] and the lack of it as a barrier.[39,56,58]

Pharmacies facilitate adherence to antihypertensive medication through giving out or selling pill organizers and providing medication preparation services, such as preparing medication into daily packages and delivering it to homes. Furthermore, some pharmacists label the medication packages with the medication schedule, inform patients of the medication still available on the prescription, and motivate them to take antihypertensive medication. This finding is consistent with a previous study in which patients showed trust in pharmacies.[55] However, as noted by our participants, in Portugal, these services provided by pharmacies are not universally accessible, and some are charged.[65] It might be beneficial to integrate them into healthcare to increase accessibility.

Patient recommendations and strategies to improve adherence to antihypertensive medication are summarized in Table 5, and they are aligned with interventions indicated by prior research.[66]

Patients proposed that medications follow a chromatic code. Research has shown that patients typically identify their medications by color and shape.[57] According to this, if drugs were organized by color, patients might find it easier to associate their prescriptions with their intended purpose.

Another suggestion was to use blisters with daily labelling, like the blisters from contraceptives, to increase adherence to HTN treatment. This is in agreement with previous research showing patient adherence had a statistically significant increase after six months of blisters with daily labelling.[67]

Several motivational interventions have been studied to increase therapeutic adherence.[28] In this meeting, participants suggested using focus groups for this specific purpose, which was not found elsewhere.

Participants also proposed that psychologists could help improve medication adherence. This result aligns well with previous studies, emphasizing the importance of understanding why specific individuals do not adhere to their medication regimens and stating that interventions to improve are likely most effective when designed by interdisciplinary teams.[59,68]

As in our pilot study,[36] patients suggested an automated medication dispenser, which has been tested.[69] Other participants proposed the use of technological innovations, such as smartwatches, which are also being considered by researchers[70] and digital apps, which have already shown a statistically significant increase in medication adherence in several studies.[28]

Compared specifically with focus groups of Portuguese healthcare professionals, these perspectives share some common suggestions. These encompassed the preparation of medication and the use of technological resources to support adherence. However, Portuguese patients with HTN propose a broader range of strategies to improve adherence, including changes to pill blister packaging, reducing medication costs, organizing focus groups, expanding healthcare teams to include psychologists, and offering additional virtual appointments specifically focused on adherence support.

Implications for Research and Clinical Practice

In this study, patients with HTN, the main determinants of medication adherence, were key informants and pointed directly to potential solutions for addressing and detailing the main factors influencing medication adherence. This work provides data to enhance PHC in Portugal by offering practical solutions for GP/FM and local and national Healthcare authorities regarding medication adherence.

HTN Primary care patients and Healthcare Professionals from Portugal will be questioned using validated questionnaires designed based on this study to identify the most adequate strategies to improve medication adherence to antihypertensive medicines.

The strategies of this study were provided specifically by Portuguese patients with HTN within the context of their needs and culture.

To our knowledge, this is the first study to provide qualitative insight into what patients with HTN find helpful or lacking in medication adherence management for HTN in Portugal, which can help them adhere to pharmacological treatment for HTN.

These results can be incorporated into a future comprehensive adherence program involving a multidisciplinary team of physicians, pharmacists, nurses, and psychologists to enhance medication adherence in HTN and improve health outcomes related to medication adherence and HTN.

Conclusion

This study successfully gathered evidence that Portuguese patients' insights into adherence to antihypertensive medication are essential. The findings also brought together their views on the role of technology, family, and primary health services in promoting medication adherence. Key contributions included patients' proposals for changes in medication packaging, reduction in medication cost, the integration of focus groups as adherence interventions, and the involvement of psychologists in care. They also highlighted practical solutions within primary healthcare, such as regular phone calls, nurse-led medication preparation, self-monitoring tools, and support from volunteers. In addition, patients emphasised the use of digital applications, automated calls, and monitoring devices.

Incorporating these patient-derived strategies is particularly important in the Portuguese context, as it helps to select, from the wide range of approaches described in the literature, those considered meaningful locally, while also adding new proposals shaped by patients' lived experiences within their current healthcare and social conditions.

Future challenges lie in designing interventions that help patients with HTN improve their medication adherence by utilizing these strategies as a framework. This will require ensuring accessibility, integrating low-cost technological solutions, and adapting pharmacy, primary care, and other healthcare resources to patients' needs.

Data Sharing Statement

The datasets generated and analyzed during the current study are not publicly available due to confidentiality commitments outlined in the study protocol. As stated in the protocol, the research team will retain all confidential data for five years, storing it exclusively on password-protected computers accessible only to the authors. However, data are available from the corresponding author on reasonable request.

Ethics Approval and Consent to Participate

The Ethics Committee of the University of Coimbra approved this study (CE-026/2021) and obtained informed consent from all participants. This study adhered to the Declaration of Helsinki and all relevant ethical guidelines and regulations.

Patient Consent for Publication

All participants provided written informed consent to publish anonymized clinical and personal data included in this study.

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References

1. Stanaway JD, Afshin A, Gakidou E, et al. Global, regional, and national comparative risk assessment of 84 behavioral, environmental and occupational, and metabolic risks or clusters of risks for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study. *Lancet*. 2018;392(10159):1923–1994. doi:10.1016/S0140-6736(18)32225-6
2. World Health Organization. Global report on hypertension: the race against a silent killer; 2023. Available from: https://www.who.int/publications/i/item/9789240081062. Accessed October 1, 2025.
3. GBD 2015 Risk Factors Collaborators. Global, regional, and national comparative risk assessment of 79 behavioural, environmental and occupational, and metabolic risks or clusters of risks, 1990-2015: a systematic analysis for the Global Burden of Disease Study 2015. *Lancet*. 2016;388(10053):1659–1724. doi:10.1016/S0140-6736(16)31679-8
4. Zhou B, Carrillo-Larco RM, Danaei G, et al. Worldwide trends in hypertension prevalence and progress in treatment and control from 1990 to 2019: a pooled analysis of 1201 population-representative studies with 104 million participants. *Lancet*. 2021;398(10304):957–980. doi:10.1016/S0140-6736(21)01330-1
5. Forouzanfar MH, Liu P, Roth GA, et al. Global burden of hypertension and systolic blood pressure of at least 110 to 115mmHg, 1990-2015. *JAMA*. 2017;317(2):165–182. doi:10.1001/jama.2016.19043
6. Rodrigues A, Gaio V, Kislaya I, et al. Prevalência de hipertensão arterial em Portugal: resultados do primeiro Inquérito Nacional com Exame Físico (INSEF 2015). *Boletim epidemiológico Observações INSA*. 2017;9(2).
7. Marques da Silva P, Lima MJ, Neves PM, Espiga de Macedo M. Prevalence of cardiovascular risk factors and other comorbidities in patients with hypertension in Portuguese primary health care populations: the PRECISE study. *Revista Portuguesa de Cardiologia*. 2019;38(6):427–437. doi:10.1016/j.repc.2018.09.011
8. Polonia J, Martins L, Pinto F, Nazare J. Prevalence, awareness, treatment and control of hypertension and salt intake in Portugal: changes over a decade. The PHYSA study. *J Hypertens*. 2014;32(6):1211–1221. doi:10.1097/HJH.0000000000000162
9. Visseren F, Mach F, Smulders YM, et al. 2021 ESC Guidelines on cardiovascular disease prevention in clinical practice. *Eur Heart J*. 2021;42(34):3227–3337. doi:10.1093/eurheartj/ehab484
10. Poulter NR, Borghi C, Parati G, et al. Medication adherence in hypertension. *J Hypertens*. 2020;38(4):579–587. doi:10.1097/HJH.0000000000002294
11. Coelho A. *Adherence to Antihypertensive Therapy: Analysis of Initiation, Implementation, Discontinuation and Possible Risk Factors in Portuguese Primary Care Units* [doctoral thesis]. NOVA Medical School; 2016. Available from: https://run.unl.pt/handle/10362/20673. Accessed December 29, 2024.

12. Cabral AC, Castel-Branco M, Caramona M, Fernandez-Llimos F, Figueiredo IV. Developing an adherence in hypertension questionnaire short version: MUAH-16. *J Clin Hypertens*. 2018;20(1):118–124. doi:10.1111/jch.13137
13. Cabral AC, Moura-Ramos M, Castel-Branco M, Fernandez-Llimos F, Figueiredo IV. Cross-cultural adaptation and validation of a European Portuguese version of the 8-item Morisky medication adherence scale. *Revista Portuguesa de Cardiologia*. 2018;37(4):297–303. doi:10.1016/j.repc.2017.09.017
14. Pinto A. *Projeto de Intervenção Em Saúde Comunitária: Viver Com Hipertensão Arterial e Adesão Ao Regime Terapêutico - Intervir Para Prevenir*. Instituto Politécnico de Beja; 2012. Available from: https://comum.rcaap.pt/entities/publication/5f16ede6-ee77-4cd4-a83a-00a2e3298758. Accessed June 23, 2025.
15. Dias A, Cunha M, Ribeiro O, Andrade A. Crenças acerca da medicação e adesão terapêutica em utentes hipertensos. *Servir*. 2016;59. doi:10.48492/servir0259.23187
16. Ribeiro D. *Adesão terapêutica e qualidade de vida em adultos e adultos idosos com hipertensão: fatores motivacionais*. Universidade do Porto; 2013. Available from: https://repositorio-aberto.up.pt/bitstream/10216/111008/2/255821.pdf. Accessed June 23, 2025.
17. Diana do Rosário Carneiro Leão. *Adesão à terapêutica na Hipertensão Arterial*. Universidade do Porto; 2018. Available from: https://share.google/e3ODvOq5J06PoNRYs. Accessed October 1, 2025.
18. Moita B. *Adesão Terapêutica e Hipertensão Arterial: O Uso de Fontes Administrativas de Dados de prescrição e Levantamento de Medicação Na Estimação Da Adesão à Terapêutica Com Antagonistas Dos Recetores Da Angiotensina*. Universidade Nova de Lisboa; 2012. Available from: http://hdl.handle.net/10362/14729. Accessed October 1, 2025.
19. Lopes E, Alarcão V, Simões R, et al. Controlo da hipertensão arterial nos cuidados de saúde primários: uma comparação entre nativos portugueses e imigrantes dos países africanos de língua oficial portuguesa. *Acta Med Port*. 2016;29(3):193–204. doi:10.20344/amp.6714
20. Morgado M, Rolo S, Castelo-Branco M. Pharmacist intervention program to enhance hypertension control: a randomised controlled trial. *Int J Clin Pharm*. 2011;33(1):132–140. doi:10.1007/s11096-010-9474-x
21. Morgado M, Rolo S, MacEdo A, Pereira L, Castelo-Branco M. Predictors of uncontrolled hypertension and antihypertensive medication nonadherence. *J Cardiovasc Dis Res*. 2010;1(4):196–202. doi:10.4103/0975-3583.74263
22. Ferreira R, Graça L, Calvinho M. Therapeutic adherence of hypertensive patients in primary health care. *Rev Enferm Refer*. 2016;4(8):7–15. doi:10.12707/RIV15070
23. Barata Delgado A, Luísa Lima M. Contributo para a validação concorrente de uma Medida de Adesão aos Tratamentos. *Psicologia Saúde & Doenças*. 2001;2(2):81–100.
24. Silva J. *Estudo da adesão à terapêutica farmacológica anti-hipertensora*. Universidade da Beira Interior; 2013. Accessed June 23, 2025. https://ubibliorum.ubi.pt/entities/publication/a457d382-50c0-4a80-84a9-6d51a214dc79.
25. Lee EKP, Poon P, Yip BHK, et al. Global Burden,Regional Differences,Trends, and Health Consequences of Medication Nonadherence for Hypertension During 2010 to 2020: a Meta-Analysis Involving 27 Million Patients. *J Am Heart Assoc*. 2022;11(17). doi:10.1161/JAHA.122.026582
26. Kengne AP, Brière JB, Zhu L, et al. Impact of poor medication adherence on clinical outcomes and health resource utilization in patients with hypertension and/or dyslipidemia: systematic review. *Expert Rev Pharmacoecon Outcomes Res*. 2024;24(1):143–154. doi:10.1080/14737167.2023.2266135
27. Félix J, Ferreira D, Afonso-Silva M, et al. Social and economic value of Portuguese community pharmacies in health care. *BMC Health Serv Res*. 2017;17(1):606. doi:10.1186/s12913-017-2525-4
28. Rosendo-Silva B, Ortigosa-Ferreira AC, Prazeres F, Caramelo F, Santiago LM, Rosendo I. Systematic review of motivational interventions to improve adherence to medication in patients with hypertension and meta-analysis. *Hipertens Riesgo Vasc*. 2023. doi:10.1016/j.hipert.2023.04.003
29. Cross AJ, Elliott RA, Petrie K, Kuruvilla L, George J. Interventions for improving medication-taking ability and adherence in older adults prescribed multiple medications. *Cochrane Database Syst Rev*. 2020;2020(5). doi:10.1002/14651858.CD012419.pub2
30. Choudhry NK, Kronish IM, Vongpatanasin W, et al. Medication adherence and blood pressure control: a scientific statement from the American Heart Association. *Hypertension*. 2022;79(1):E1–E14. doi:10.1161/HYP.0000000000000203
31. Alghurair SA, Hughes CA, Simpson SH, Guirguis LM. A systematic review of patient self-reported barriers of adherence to antihypertensive medications using the world health organization multidimensional adherence model. *J Clin Hypertens*. 2012;14(12):877–886. doi:10.1111/j.1751-7176.2012.00699.x
32. Dietrich F, Zeller A, Hersberger KE, Arnet I. Adherence Monitoring Package (AMoPac) in patients suspected of non-response to antihypertensive treatment: perceived usefulness by general practitioners. *BMJ Open Qual*. 2024;13(1):e002451. doi:10.1136/bmjoq-2023-002451
33. Zhou X, Zhang X, Gu N, Cai W, Feng J. Barriers and facilitators of medication adherence in hypertension patients: a meta-integration of qualitative research. *J Patient Exp*. 2024;11. doi:10.1177/23743735241241176
34. Edward A, Campbell B, Manase F, Appel LJ. Patient and healthcare provider perspectives on adherence with antihypertensive medications: an exploratory qualitative study in Tanzania. *BMC Health Serv Res*. 2021;21(1):834. doi:10.1186/s12913-021-06858-7
35. Gupta S, Dhamija JP, Mohan I, Gupta R. Qualitative study of barriers to adherence to antihypertensive medication among rural women in India. *Int J Hypertens*. 2019;2019:5749648. doi:10.1155/2019/5749648
36. Rosendo-Silva B, Lima Silva IB, Prazeres F, Santiago LM. Adherence to pharmacological therapy for hypertension: focus group with patients. *Aten Primaria*. 2023;55(2):102549. doi:10.1016/j.aprim.2022.102549
37. Rosendo-Silva B, Gonçalves J, Prazeres F, Santiago LM, Rosendo I. Adherence to pharmacological therapy for hypertension in Portugal: a health professionals focus groups study. *BMC Prim Care*. 2025;26(1):44. doi:10.1186/s12875-025-02705-4
38. Krueger RA, Casey M. *Focus Groups: A Practical Guide for Applied Research*. 5th ed. Sage Publications; 2015.
39. Rosendo-Silva B, Prazeres F, Santiago LM, Rosendo I. Adherence to pharmacological therapy in patients with hypertension: protocol of a qualitative study by focus groups. *BMJ Open*. 2024;14(4):e076416. doi:10.1136/bmjopen-2023-076416
40. Guest G, Namey E, McKenna K. How many focus groups are enough? Building an evidence base for nonprobability sample sizes. *Field Methods*. 2017;29(1):3–22. doi:10.1177/1525822X16639015
41. Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *Int J Qual Health Care*. 2007;19(6):349–357. doi:10.1093/intqhc/mzm042

42. O'Brien BC, Harris IB, Beckman TJ, Reed DA, Cook DA. Standards for reporting qualitative research: a synthesis of recommendations. *Acad Med*. 2014;89(9):1245–1251. doi:10.1097/ACM.0000000000000388
43. Instituto Nacional de Estatística. NUTS 2013 - As Novas Unidades Territoriais Para Fins Estatísticos; 2015.
44. VERBI Software. Consult. Sozialforschung GmbH. MAXQDA, Software for qualitative data analysis, 1989 – 2025; 2024. Available from: https://www.maxqda.com. Accessed October 1, 2025.
45. Moretti F, van Vliet L, Bensing J, et al. A standardized approach to qualitative content analysis of focus group discussions from different countries. *Patient Educ Couns*. 2011;82(3):420–428. doi:10.1016/j.pec.2011.01.005
46. Burnier M. Drug adherence in hypertension. *Pharmacol Res*. 2017;125:142–149. doi:10.1016/j.phrs.2017.08.015
47. Lauri MA. WASP (Write a Scientific Paper): collecting qualitative data using focus groups. *Early Hum Dev*. 2019;133:65–68. doi:10.1016/j.earlhumdev.2019.03.015
48. Sabaté E. Adherence to long-term therapies: evidence for action. World Health Organization; 2003. Available from: https://www.paho.org/en/documents/who-adherence-long-term-therapies-evidence-action-2003. Accessed November 14, 2023.
49. OECD. Under pressure: the squeezed middle class. OECD Publishing. 2019. doi:10.1787/689afed1-en.
50. Bispo Júnior JP. Social desirability bias in qualitative health research. *Rev Saude Publica*. 2022;56:101. doi:10.11606/s1518-8787.2022056004164
51. Barbour R. *A New Era in Focus Group Research: Challenges, Innovation and Practice*. Palgrave Macmillan; 2017. doi:10.1057/978-1-137-58614-8
52. Pope C, Mays N, eds.. *Qualitative Research in Health Care*. 4th ed. John Wiley & Sons Ltd; 2020.
53. Marshall IJ, Wolfe CDA, McKevitt C. Lay perspectives on hypertension and drug adherence: systematic review of qualitative research. *BMJ*. 2012;345e3953. doi:10.1136/bmj.e3953
54. Rahman ARA, Wang JG, Kwong GMY, Morales DD, Sritara P, Sukmawan R. Perception of hypertension management by patients and doctors in Asia: potential to improve blood pressure control. *Asia Pac Fam Med*. 2015;14(1):1–11. doi:10.1186/s12930-015-0018-3
55. Naheed A, Haldane V, Jafar TH, Chakma N, Legido-Quigley H. Patient pathways and perceptions of hypertension treatment, management, and control in rural Bangladesh: a qualitative study. *Patient Prefer Adherence*. 2018;12:1437–1449. doi:10.2147/PPA.S163385
56. Malkon S, Wettermark B, Kahan T, Bastholm-Rahmner P, Hasselström J, Qvarnström M. A qualitative study on patients' views on hypertension and antihypertensive medications. *Patient Prefer Adherence*. 2023;17:3331–3339. doi:10.2147/PPA.S429638
57. Tan CS, Hassali MA, Neoh CF, Saleem F. A qualitative exploration of hypertensive patients' perception towards quality use of medication and hypertension management at the community level. *Pharm Pract*. 2017;15(4):1074. doi:10.18549/PharmPract.2017.04.1074
58. Perera M, de Silva CK, Tavajoh S, et al. Patient perspectives on hypertension management in health system of Sri Lanka: a qualitative study. *BMJ Open*. 2019;9(10):e031773. doi:10.1136/bmjopen-2019-031773
59. Bosworth HB, Blalock DV, Hoyle RH, Czajkowski SM, Voils CI. The role of psychological science in efforts to improve cardiovascular medication adherence. *Am Psychol*. 2018;73(8):968–980. doi:10.1037/amp0000316
60. Bakris GL, Saxena M, Gupta A, et al. RNA interference with zilebesiran for mild to moderate hypertension. The KARDIA-1 Randomized Clinical Trial. *JAMA*. 2024;331(9):740–749. doi:10.1001/jama.2024.0728
61. Vrijens B, De Geest S, Hughes DA, et al. A new taxonomy for describing and defining adherence to medications. *Br J Clin Pharmacol*. 2012;73(5):691–705. doi:10.1111/j.1365-2125.2012.04167.x
62. Axelsson M, Brink E, Lundgren J, Lötvall J. The influence of personality traits on reported adherence to medication in individuals with chronic disease: an epidemiological study in West Sweden. *PLoS One*. 2011;6(3):e18241. doi:10.1371/journal.pone.0018241
63. Chun-Yun Kang G. Technology-based interventions to improve adherence to antihypertensive medications – an evidence-based review. *Digit Health*. 2022;8. doi:10.1177/20552076221089725
64. Irani E, Niyomyart A, Hickman RL. Systematic review of technology-based interventions targeting chronically ill adults and their caregivers. *West J Nurs Res*. 2020;6(11):437–447. doi:10.1177/0193945919897011
65. National Association of Pharmacies. *Portuguese Pharmacies White-Book*; 2023. Available from: https://www.livrobrancodasfarmaciasportuguesas.pt/media/sqepz0vy/portuguese-pharmacies-white-book_executive-summary_eng.pdf. Accessed August 20, 2024.
66. Burnier M, Egan BM. Adherence in hypertension: a review of prevalence, risk factors, impact, and management. *Circ Res*. 2019;124(7):1124–1140. doi:10.1161/CIRCRESAHA.118.313220
67. Tan BY, Shafie AA, Hassali MAA, Saleem F, Muneswarao J. Improving medication adherence through calendar packaging: results of a randomized controlled trial among hypertensive patients. *J Pharm Health Serv Res*. 2017;8(2):115–122. doi:10.1111/jphs.12171
68. Unger T, Borghi C, Charchar F, et al. 2020 International Society of Hypertension global hypertension practice guidelines. *Hypertension*. 2020;75(6):1334–1357. doi:10.1161/HYPERTENSIONAHA.120.15026
69. Hoffmann C, Schweighardt A, Conn KM, et al. Enhanced adherence in patients using an automated home medication dispenser. *J Healthc Qual*. 2018;40(4):194–200. doi:10.1097/JHQ.0000000000000097
70. Ruberti OM, Yugar-Toledo JC, Moreno H, Rodrigues B. Hypertension telemonitoring and home-based physical training programs. *Blood Press*. 2021;30(6):428–438. doi:10.1080/08037051.2021.1996221