



# Optimizing Hypertension Control Globally: WHF Roadmap

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Accepted: 11 October 2022

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## Abstract

**Purpose of Review** Hypertension represents the most important cardiovascular risk factor, affecting over 4.06 billion adults worldwide. In this review, we will discuss potential barriers and their solutions to improve prevention, detection, and management of hypertension.

**Recent Findings** The prevalence of hypertension has been increasing in low- and middle-income countries, requiring new strategies to improve its recognition and proper management. The World Heart Federation (WHF) developed a roadmap for hypertension, advising health system policies and clinical practices as part of its commitment to improving global cardiovascular health. The World Health Organization (WHO) has published in 2021 practical guidelines for the pharmacological treatment of hypertension in adults.

**Summary** Identifying potential roadblocks and solutions deserves high priority to improve the detection, management, and control of hypertension.

**Keywords** Hypertension · WHF roadmap · Telemedicine · Fixed dose combinations · Global health · Heart failure

## Introduction

High blood pressure (BP) is a major cardiovascular risk factor, and hypertension is the leading cause of disability-adjusted life-years and death worldwide [1, 2].

According to the latest Global Burden of Disease study (GBD) update, raised BP affected 4.06 billion adults globally in 2019 and 10% of the global healthcare spending is directly related to raised BP and its complications [3••, 4, 5]. The prevalence of raised BP remained stable in high-income countries for the last two decades, but it is still increasing in low- and middle-income countries [6, 7]. The progress in hypertension awareness, treatment, and control rates has mainly occurred in the 1990s to early-mid 2000s, and since then, plateaued or deteriorated, particularly in low- and middle-income countries [8]. The improvement of

hypertension in low- and middle-income countries faces significant resource constraints, governance difficulties, lack of funding, and poor prioritization due to competing priorities such as infectious diseases and maternal and child health [9].

Considering the burden of hypertension, improving its detection, management, and control deserves high priority. The World Heart Federation (WHF) developed a roadmap for hypertension, advising health system policies and clinical practices as part of its commitment to improving global cardiovascular health [10, 11••].

This review aims to discuss potential barriers and their solutions to improve prevention, detection, and management of hypertension worldwide.

## Prevention: Lifestyle and Environmental Changes

Non-pharmacological interventions are an essential component for the prevention and management of hypertension [12]. Effective lifestyle changes may be sufficient to delay or prevent the need for drug therapy and can also contribute to achieve better BP control and reduce the dosage of anti-hypertensive drugs [13]. However, only a minority of adults change their lifestyle after a diagnosis of hypertension, and

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This article is part of Topical Collection on *Global Cardiovascular Health*

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sustainability is difficult, posing a substantial challenge for the successful implementation of a healthy lifestyle [14]. Thus, community-level strategies that accelerate the implementation of health-promoting policies can create an environment where people are more compelled to adopt or continue healthy behaviors and may have the greatest influence on health outcomes [11••]. The recommended lifestyle measures that have been shown to reduce BP include weight management, a healthy diet, salt restriction, regular physical activity, and moderation of alcohol consumption [12].

### Dietary Sodium Restriction

Sodium restriction has been shown to have a BP-lowering effect and reduce cardiovascular disease risk [15–17]. Effective sodium restriction may reduce the number or dosage of antihypertensive drugs necessary to achieve BP control in people with hypertension [18]. Although there is controversy about the most appropriate target for sodium intake, WHO recommends reducing sodium intake to <2 g/day (5 g/day salt) in adults [17]. The reduction of salt intake should be a public health priority, requiring combined effort between government policies, food industry, and population education, as 80% of salt consumption involves hidden salt in processed foods [12].

In addition to salt restriction, salt substitution is a non-pharmacological approach to reduce BP [11••]. It involves the partial replacement of sodium chloride with any combination of other salt containing potassium, magnesium, or aluminum. A meta-analysis using different combinations of salt substitutes compared to usual salt found that a salt substitute reduced systolic BP by  $-4.9$  mmHg (95%CI:  $-7.3, -2.5$ ) and diastolic BP by  $-1.5$  mmHg (95%CI:  $-2.7, -0.3$ ) [19]. In addition, salt replacement strategy has been demonstrated to halve the incidence of hypertension in individuals without hypertension [20].

### Other Dietary Changes

The population should be advised to eat a healthy balanced diet containing vegetables, fresh fruit, fish, whole grains, low-fat products, and unsaturated fatty acids and reduce consumption of refined sugar, saturated fat, and cholesterol [11••, 12, 18]. In individuals with hypertension, increasing potassium intake lowers BP, especially among those with a diet with high intake of sodium [15, 21]. Because of its BP-lowering effect, increased potassium intake has been demonstrated to decrease the risk of cardiovascular disease and mitigate the adverse effects of salt on BP. The aim is for 3500–5000 mg/d per day, preferably by a diet rich in potassium. In addition, potassium supplementation was demonstrated to be safe and to have a modest but

significant impact on BP lowering [22]. Replacing high-sodium salt with potassium-rich salt is recommended, and no significant difference was shown in the taste of potassium-enriched salt and regular salt [23].

The modified dietary approaches to stop hypertension (DASH) diet was a potentially effective treatment for pre-hypertensive and hypertensive patients, with an expected effect of up to 11 mmHg reduction in systolic BP [24]. A systematic review demonstrated that the DASH diet could reduce BP, waist circumference, and triglyceride concentration in hypertensive patients [25]. The combination of low sodium intake and the DASH diet provides substantially greater BP reduction than sodium restriction or the DASH diet alone [26, 27].

Interventions in school systems, such as educational initiatives and prioritizing improvements in school nutrition programs, can be connected to broader community and family initiatives to confer additional benefit [28–30].

### Weight Reduction

Excessive weight gain is associated with hypertension, and reducing weight towards an ideal body weight decreases BP [31]. It is expected to reduce about one mmHg for every 1 kg reduction in body weight [32]. Weight loss can also improve the efficacy of antihypertensive medications [18]. Weight loss should employ a multidisciplinary approach that includes dietary advice, motivational counselling, and regular exercise.

### Regular Physical Activity

Regular physical activity is beneficial for preventing and treating hypertension and is associated with lower cardiovascular risk and mortality [18]. A 90–150 min/week of aerobic and dynamic resistance exercise is expected to reduce up to 5 and 4 mmHg in systolic BP, respectively [33]. In addition, three sessions/week of isometric resistance exercise were demonstrated to reduce up to 5 mmHg in systolic BP [34].

To improve physical activity, patients should be encouraged to participate in organized activities such as recreational sports available in the community, which provides both social and cardiovascular benefits. Policies and strategies that enable the creation of healthy and safe physical environments can enhance the sustainability of interventions designed to promote physical activity. Initiatives such as “*Million Hearts*” recommend that communities make changes in the environment in which people live, learn and work, and create activity-friendly routes to everyday destinations, including worksites and schools, to promote safety and convenience to enhance physical activity [35].

## Moderation in Alcohol Intake

There is a positive linear association between alcohol consumption and hypertension and cardiovascular disease prevalence [36]. A complete abstinence or limit alcohol intake to  $\leq 2$  standard drinks per day with 2 days off per week is recommended and expected to reduce up to 3–4 mmHg in systolic BP [37].

## Tobacco Control Programs

Reducing the tobacco use by the implementation of effective tobacco control programs is essential to improve cardiovascular burden. Although tobacco taxation and prices have demonstrated to be one of the most direct and reliable method for reducing tobacco use, other measures, such as banning tobacco advertising, prohibiting smoking in public spaces, and promoting warning about the dangers of tobacco use by including health warning on packaging and antismoking advertising, are important additional measures to reduce the burden of tobacco use [38].

## Environmental Factors

Several environmental factors affect BP. Associations between raised BP levels and low greenness, poor housing conditions, cooking fuel use, and indoor air pollution have been observed [39–41]. There is an association between air pollution and cardiovascular disease, and fine particulate matter  $< 2.5 \mu\text{g}$  (PM<sub>2.5</sub>) was identified as a significant contributor to hypertension [42]. Thus, controlling indoor and outdoor air pollution, improving greenness levels, and subsidizing cleaner cooking fuels may also have beneficial effects on BP levels. Public policies that promote a healthy environment need to be prioritized as they can play a crucial role in preventing and controlling hypertension.

## Diagnosis and Evaluation

The asymptomatic nature of hypertension in conjunction with its disease burden highlights the importance of routine BP screening. According to the WHF, hypertension screening should occur from the age of 18 and be repeated every 2 years, depending on the availability of resources, while guidelines have taken a more pragmatic approach of recommending repeat measurement between 1 and 5 years depending on BP [11••]. Opportunistic screening for hypertension and frequent measurement of BP is of particular relevance in high-risk individuals to increase awareness of hypertension and for early diagnosis and

initiation of appropriate treatment. In addition, evidence suggests that setting-based screening programs (screening at workplaces, schools, places of worship, etc.) improve the diagnosis and control rate of hypertension [43].

Estimation of BP is highly prone to systematic error, and the quality of BP assessments in clinical practice is still poor [44]. Different equipment and techniques are used for BP measurement, and the accuracy of these devices varies widely and reduces the efficacy of mass BP screening programs to diagnose hypertension accurately [11••]. Particularly in low-resource settings, access and procurement of validated and accurate BP machines remain a challenge [45]. Improving the quality of the BP measurements used for diagnosis and management of hypertension through endorsed protocols, trained clinicians, and certified BP monitors is fundamental to translating clinical practice recommendations [11••]. In agreement with the WHO quality standard for BP machines, having a sufficient number of calibrated and validated machines available to ensure screening and diagnosis should be a priority [45, 46].

Out-of-office BP measurements—such as self-home BP monitoring (HBPM) or 24-h ambulatory BP monitoring (ABPM)—should be encouraged and are the recommended strategy for diagnosing and managing hypertension [12, 18]. Besides the advantage of better prediction of cardiovascular risk, enhanced diagnosis of white-coat hypertension, and identification of masked hypertension, out-of-office BP measurement offers the advantage of encouraging patient involvement in hypertension management and facilitating telemonitoring [47]. However, both HBPM and ABPM are used sparingly in primary care settings in most countries, particularly in the low- and middle-income countries, due to resource limitations [11••]. Therefore, effective and sustainable strategies for implementing out-of-office BP testing need to be developed to strengthen hypertension control initiatives [11••]. An important complement is to train patients and non-physician health workers for accurate measurement of BP, since this strategy may improve the diagnosis of hypertension [45]. A systematic review demonstrated that the community-based non-physician or self-screening could lead to the identification of new cases of hypertension [48].

Real-life examples such as the “May Measurement Month” (MMM), an initiative led by the International Society of Hypertension and endorsed by the World Hypertension League and WHF, is an annual globally synchronized BP screening campaign designed primarily to raise awareness of the importance of BP measurement at the population level and, in the process, detect untreated or inadequately treat hypertension [49]. One critical finding of MMM in 2019 was that nearly one-third of the screeners had never had their BP measured previously [49].

## Strengthen Primary Care

Primary care physicians and other allied healthcare workers should be at the forefront of managing hypertension [11••]. The paradigm shift to move the gravity center of hypertension programs from specialized secondary care to the community levels (primary care) is essential for population-wide impact.

## Promote and Implement Task-sharing and Team-based Care

In most countries, primary care physicians are encouraged to be the main healthcare providers in what concerns the prevention and control of cardiovascular risk factors. However, most of the low-income countries have an inadequate number of physicians, especially in rural and remote regions [50].

To overcome these constraints, task-sharing strategies that involve transferring less skilled tasks to non-physician health workers under the supervision of a physician are effective in addressing some of the critical barriers to improve hypertension control [11••].

Non-physician health workers can be effectively trained in the implementation of cardiovascular disease prevention and management [11••]. They could be involved in screening, referral to clinicians, providing lifestyle advice, improving the health literacy of communities, and supporting adherence to medication [51, 52]. A systematic review and meta-analyses support task-sharing interventions involving multiple non-physician health workers (community health workers, medical assistants, nurses, dietitians, and pharmacists) in the management of hypertension in low- and middle-income countries [8].

Nurses can play a unique and important role in care delivery and increase patient satisfaction [53]. They can counsel patients and help them build skills for lifestyle changes, educate patients on BP self-measurement monitoring and medication adherence strategies, and even intensify medication therapy using a standardized protocol [54•, 55].

Pharmacists can also be integral members of the hypertension care team. Studies conducted in high-income countries, such as the USA and Canada, have demonstrated that pharmacist interventions on hypertension can help achieve remarkable results, including improved adherence to drug therapy, lowered BP, better health outcomes, and savings to medical expenditure [56, 57]. Consequently, the Canadian government has issued guidelines and standards for community pharmacist care for hypertensive patients [58].

In a systematic review on the impact of interventions by community pharmacists on the control of hypertension, pharmacist interventions were demonstrated to improve BP control in outpatients compared with the usual care [59].

However, while in high-income countries, nurses and pharmacists are usually more easily accessible in the community than medical doctors, giving them an advantage in managing hypertension, and in the low- and middle-income countries, a shortage of properly trained nurses and pharmacists is common and could compromise the effectiveness of these professionals' interventions [60]. Besides that, a systematic review demonstrated that in low- and middle-income countries, task-sharing involving pharmacists and nurses led to significant reductions in BP [8].

Community health workers can play an active role in health promotion and disease prevention in their communities [11••]. Through an established collaborative model, community health workers can provide a broad range of linguistically and culturally appropriate health promotion and disease prevention strategies, including education for health, informal counselling, and BP screening [45, 61]. Interventions that include community health workers have been deemed cost-effective for hypertension [8, 62].

Technology, clear guidelines, and close supervision by physicians may aid task redistribution by standardization of the performance of certain tasks by non-physician health workers. The WHO suggests that non-physician professionals, such as nurses and pharmacists, can provide the pharmacological treatment of hypertension if conditions such as proper training, prescribing authority, availability of specific protocols, and physician oversight are met [45]. Thus, strengthening the implementation of task-sharing and team-based care is a priority for the near future [45].

## Pharmacological Interventions

The use of antihypertensive medication differs by world region [7]. Overall, 37% of adults with hypertension worldwide were taking antihypertensive medication in 2010, and the use of antihypertensive medication was more common in high-income versus middle- or low-income regions (56% vs 29%) [7]. The Prospective Urban Rural Epidemiology (PURE) study reported findings from 142,042 participants aged 35–70 years from three high-income countries, seven upper-middle-income countries, and seven low-income countries and lower-middle-income countries. Overall control was worst in low-income and lower-middle-income countries (11%), compared with 19% in high-income countries and 16% in upper-middle-income countries. Some

reasons for the low frequency of treatment and control of hypertension included insufficient therapy and poor access to the healthcare system [63].

Hypertension guidelines support low-dose pharmacological therapy initially and subsequent up-titration based on the achieved BP and tolerability, as low-dose combinations of antihypertensive agents are more effective in BP-lowering and well-tolerated than high-dose monotherapies [12]. A single-pill combination of drugs at lower doses is recommended as it may provide improvements in adherence, efficacy, and tolerability of therapy [18]. In 2019, single-pill antihypertensive drug combinations were listed on the WHO Essential Medicine's list [64]. The major challenge of the integration and scalability of hypertension control initiatives is to translate research findings to real-life settings. A lack of understanding of guidelines by healthcare professionals was identified as a barrier to its implementation, particularly in low- and middle-income countries [45].

Clinician therapeutic inertia is a contributing factor for failure to achieve BP targets [65]. Several reasons may underlie clinicians not initiating or intensifying antihypertensive medication, including time constraints, workload pressure placed on physicians, concern about side effects, lack of knowledge to make dosing decisions, and uncertainty regarding a patient's out-of-office BP [66, 67]. Prescription of a fixed dose combination when initiating antihypertensive treatment may overcome therapeutic inertia as it can reduce the number of follow-up visits needed and has been demonstrated to achieve a higher rate of BP control [68, 69]. The Triple Pill versus Usual Care Management for Patients with Mild-to-Moderate Hypertension (TRIUMPH) trial showed a greater reduction in BP in patients using fixed-combination, low-dose, triple-pill antihypertensive therapy (consisting of amlodipine, telmisartan, and chlorthalidone) than in those receiving usual care in Sri Lanka [70]. In addition, a within-trial and modelled economic evaluation of this trial demonstrated that the triple-pill strategy is cost-effective for patients with mild-to-moderate hypertension [71].

Inadequate supplies of essential antihypertensive drugs are a major barrier to the delivery of optimal care for the management of hypertension in low-resource settings [72]. Relying on simple treatment protocols with specific drugs and doses at each step is recommended to facilitate the procurement of large volumes of medicines of choice, which simplifies the supply chain and lower prices.

## Facilitate Adherence

Despite the demonstrated benefits of antihypertensive treatments, low adherence to hypertensive medication remains a major contributing factor to uncontrolled BP [73]. Recent reports indicate that BP control remains far from adequate

regardless of global location, with only 60% of treated subjects achieving BP control [74]. In one study, 21% of 6.627 older US adults initiating antihypertensive medication in 2012 discontinued treatment within 1 year [75]. Also, 32% of patients who had not discontinued their antihypertensive medication had low treatment adherence, defined by having medication available to take for <80% of days in the year following treatment initiation [75].

Barriers to achieve high medical adherence are multifactorial and include complex medication regimens, convenience factors (e.g., dosing and frequency), forgetfulness, issues with treatment of asymptomatic disease (including fear of possible or experienced adverse events and perceived lack of treatment benefit), cost of treatment, and limited access to care [73, 75–77]. From a health system perspective, reducing or eliminating costs for hypertension services and promoting equity of antihypertensive medication prices are key elements that facilitate adherence to treatment [11••].

A broader people-centered model (envisaging roles not only for patients but also for families, networks, and society) is a possible way to improve adherence to self-care and therapeutic options in the management of hypertension [78].

## Patients Empowerment

Hypertension awareness differs substantially around the world [7]. According to 2010 data, hypertension awareness was substantially more common in high-income countries than low- or middle-income countries (67% vs 38%) [7]. A cross-sectional study reported data from 1.1 million adults from 44 low- and middle-income countries and documented that 17.5% had hypertension. Among those with hypertension, 74% of participants had ever had their BP measured, 30% received treatment, and 10% had control of their hypertension [79].

Patient and carer education is an important strategy to improve hypertension management in primary care settings [80]. Education needs to be patient-centered and adapted, for example, by creating simple infographics and pictured-based educational materials for low literacy groups [45]. Patients should be empowered to know their BP targets to encourage active engagement in management goal setting. Promotion of self-measured BP monitoring should begin with teaching the patient how to select a validated home BP monitor with an appropriate cut size, check its accuracy by comparing with a validated one, and provide a protocol for monitoring. There is strong evidence that self-monitoring BP, especially as part of a multifaceted intervention (including counseling, telephone support, or telemonitoring), can lead to better treatment adherence and improve BP control [54•, 81, 82]. The TASMINH4 and TASMIN-SR studies have shown that

self-monitoring and self-titration of antihypertensive medication, following adequate patients' education, resulted in better BP control rates than the usual care [83, 84].

## Foster the Use of Novel Technologies

Although interventions to improve hypertension screening and management have traditionally been limited to adjustments in the current model of office-based care, advances in health technology provide new opportunities for improving hypertensive care delivery based on digital health. Telemedicine refers to interactive communications, which can be as simple as telephone-based care or interactive video and digital technologies, enabling direct communication between patients and their care team from remote sites [14].

Traditionally, BP values measured by patients at home are reported in handwritten logbooks that are often incomplete and inaccurate, which difficult its interpretation and may discourage physicians from relying on home BP monitoring data to make clinical decisions. Thus, one step beyond self-monitoring BP is telemonitoring, which allows patients to obtain their BP measurements at home and transmit readings electronically to the clinical care team, who can transmit back recommendations for lifestyle changes, medication adjustment, or schedule an appointment. This feedback loop could enhance patient engagement in care, avoid unnecessary office visits, and facilitate hypertension management, but depends on the secure data-sharing systems across clinical and community [85–87]. Telemonitoring-based interventions demonstrated to be more effective in lower BP than the usual care [88]. However, the evidence of its added benefit to self-monitoring BP is controversial—two meta-analysis has demonstrated that besides improving adherence, telemonitoring improved patient outcomes and reduced healthcare costs, while the TASMINH4 trial showed no long-term benefits of self-monitoring and telemonitoring [84, 89–92]. The WHO recommends the encouragement of both home-based self-care and telemonitoring to enhance BP control as part of an integrated management system [45].

Mobile health (mHealth), defined as the use of mobile and wireless technologies to support the achievement of health objectives, offers a range of possibilities such as patient and carer education, patient support, and adherence to treatment and lifestyle recommendations. The main advantage of mHealth technologies is the wide accessibility and the possibility to link mobile phones and related applications to wearable sensors. Although issues mainly related to the scientific validation of these healthcare applications still need to be addressed, preliminary data have reinforced the value of these technologies in improving patients' compliance and adherence to treatment [93, 94]. Smartphone applications can also assist in the self-management of hypertension by

providing reminders for medication taking, offering education and facilitating social interactions that provide support and motivation [95–97]. In addition, mHealth can provide decision support systems to help care providers adhere to guidelines and can provide novel educational interfaces that can enhance care delivery in resource-limited settings [98].

## Conclusion

Hypertension is a major preventable cardiovascular risk factor. However, despite the availability of effective and well-tolerated antihypertensive agents, suboptimal BP control is still the cause of significant morbidity and mortality worldwide. Barriers and solutions to improve hypertension prevention, detection, and control differ according to the region and should be tailored to each setting. Those solutions should include strategies to promote education and healthy lifestyle on an individual and community basis, expansion of the diagnostic capacity by the implementation of opportunist screening and out-of-office BP measurements, empowerment of patients, maximizing adherence using single-pill medications, strengthening of primary care, and integrating non-physician health workers on task-sharing of treatment and management of hypertension. The widespread health technology provides new opportunities for improving hypertension care for both patients and health system levels.

## Compliance with Ethical Standards

**Conflict of Interest** Beatriz Silva declares no conflict of interest. Faus-to J. Pinto reports personal fees from Ferrer, Vifor, and Servier, outside the submitted work.

**Human and Animal Rights and Informed Consent** This article does not contain any studies with human or animal subjects performed by any of the authors.

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- Of importance
- Of major importance

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