Global interventions in hypertension

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Abstract: It has been well established that among numerous traditional, as well as emerging, risk factors and biomarkers, hypertension still remains the most potent modifiable risk factor for cardiovascular disease. Although major diagnostic and pharmacological advances have been implemented in clinical practice, they have not been associated with a reduction in hypertension-related complications and adverse events. This highlights the major effort needed to achieve optimal prevention, detection, and management of hypertension worldwide. Several societies and regulatory authorities have suggested actions and means to overcome the current problems and obstacles. The main goals of these endeavors are expected to be achieved through the use of generalized worldwide approaches and better education of both physicians and patients. This strategy is further underlined by the disappointing results so far of actions that were either inappropriately directed at specific populations or were hampered by erroneous or complicated methods of addressing hypertension-related consequences. In addition, the essential clustering of other risk factors with hypertension, in conjunction with the crucial effect of subclinical target-organ damage on the prognosis, creates the need for a holistic approach to diagnosis and cardiovascular prevention. This review summarizes current global intervention strategies and also proposes additional ways to further improve the management of hypertension worldwide. ■ Heart Metab. 2019;79:25-29

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Introduction

Hypertension affects more than 1 billion people around the world, and that number keeps on rising every year. High blood pressure that remains either uncontrolled, or even untreated, is the sole most important cause of stroke, coronary artery disease, and heart failure. These crucial consequences of hypertension have alarmed scientists, who have focused their research on the unraveling of potential pathophysiological mechanisms of hypertension. Based on these pathophysiological pathways, various antihypertensive agents have been discovered, with a clear impact on cardiovascular risk. However, despite this impressive progress in the last few decades, the global epidemic of hypertension keeps growing. This highlights the need for well-articulated changes in the way we diagnose, evaluate, and treat high blood pressure. The traditional health care model for control of blood pressure through office visits, as well as the “one-size-fits-all” approach, have been tested and proven to be insufficient. In this review, we refer to current global strategies aimed at reducing the ill effects of hypertension, and we also suggest alternative ways to improve the management of hypertension worldwide.

How big is the problem?

A substantial number of prehypertensive subjects are now considered as patients, who must be treated accordingly. This is a result of the introduction
of lower and stricter cutoff points for the definition of hypertension based on the Systolic Blood Pressure Intervention (SPRINT) trial and several relevant meta-analyses. No matter how hypertension is defined, its prevalence is increasing worldwide as the net result of two counteracting components. On the one hand, there is a constant reduction of mean blood pressure levels by age, primarily in high-income countries, and to a lesser extent, in middle-income countries. This reflects progress in detection and management of hypertension, but it also reflects improvements in lifestyle, especially in early life. However, on the other hand, this beneficial effect is counteracted by aging of the global population, which results in a rise in the number of hypertensive patients, especially in low- and middle-income countries where increasing longevity is most marked.

The increased global prevalence of hypertension translates into a larger worldwide economic burden. The worldwide economic cost, due to both loss of productivity and the direct health care costs from noncommunicable diseases, is projected to reach 50 trillion US dollars between 2010 and 2030, with approximately 50 percent of this cost attributed to CVD. In fact, 1 out of 5 deaths worldwide have inadequate blood pressure control as the culprit. Even more disturbing is the increase in related events in low-income countries. Therefore, it comes as no surprise that the Global Burden of Disease Study currently recognizes hypertension as the principal risk factor for disability and disease worldwide. In fact, the World Health Organization Global Plan of Action for the prevention of noncommunicable diseases provides policy guidance to achieve nine voluntary goals by 2025, including a reduction by one quarter in the prevalence of hypertension. On a national and international level, medical groups and authorities prioritize and firmly support research and clinical actions to achieve blood pressure targets.

Issues on blood pressure prevention, diagnosis and evaluation

People cannot be protected from a health hazard that they are not aware of. It is crucial for them to be aware of the repercussions of hypertension on their health and to know how they can access blood pressure measurement. Unfortunately, even in our contemporary era, exact and valid measurements of blood pressure are difficult. Many efforts have been made by government and nongovernment organizations to implement proper validation of monitors with stringent protocols. This becomes extremely difficult when taking into consideration the need for simpler and more cost-effective devices. However, while lower prices might increase the accessibility for patients of blood pressure monitors, they do not guarantee the quality of measurements. Given the rising preference for ambulatory and home blood pressure measurements, where these are not performed by medical personnel during office visits, the need for reliable and accurate devices is further highlighted.

There is strong evidence that a team-based care strategy for hypertension that includes physicians, nurses, pharmacists, and community health workers is more effective for attaining blood pressure control than the “one-person” approach. This team must communicate to patients the devastating consequences of clustering of risk factors that translates into a heightened global cardiovascular risk, as was initially attempted a few decades ago with the description of the metabolic syndrome. Therefore, both the care team and the patients must be aware that targeting only one risk factor is insufficient to provide overall cardiovascular protection, and only if the patient is shielded from all risk factors can prevention be maximized.

Finally, although the vast majority of patients do not have a specific cause for their increased blood pressure, there are those few that have secondary hypertension and often can be cured. Thus, an important chapter in the initial evaluation of newly diagnosed hypertension is the investigation for possible secondary causes. This investigation requires multidisciplinary teams with the proper expertise, access to relevant tests, even in low-income countries, and finally, simple and evidenced-based algorithms for detection of the secondary causes.
**The role of arterial aging and stiffness**

Vascular function and early structural alteration are biomarkers of CVD and independent predictors of the corresponding risk. Vascular age, as assessed by arterial biomarkers, such as aortic stiffness, is a promising concept. Furthermore, it meets the criteria for the ideal biomarker of cardiovascular risk that can integrate diverse known, and unknown, cardiovascular risk factors and their cumulative effect over time. In fact, a provocative idea was recently introduced regarding individuals who have supernormal vascular aging (SUPERNova). SUPERNova can be diagnosed in subjects who present an exceptionally low arterial stiffness for their age and sex. By choosing the word SUPERNova, the authors refer to the life of a supernova—a large explosion that takes place at the end of a star’s life cycle. The relationship between black holes and supernovae is not established, but the theory of physics suggests that time slows down in a black hole, just like the aging of arteries in SUPERNova subjects. While the ability to age slowly is predetermined by genes, lifestyle and pharmaceutical interventions can also decelerate vascular senescence and improve prognosis.

Aortic pulse wave velocity (PWV), is the “gold standard” measure of aortic stiffness. Blood pressure and age are the principal determinants of aortic stiffness. The connection between hypertension and aortic stiffness is bidirectional. Evidence from the Framingham Heart Study suggests that higher blood pressure levels can accelerate the degree of aortic stiffness, giving rise to a vicious cycle of accelerated hypertension and further stiffening of large arteries. Moreover, the annual increment in PWV is greater in hypertensive subjects, suggestive of a “premature” stiffening in these patients. However, the other direction of the aortic stiffness-hypertension relationship is more intriguing and important. Indeed, important data show that aortic stiffening in young normotensive individuals is a predictor of increased systolic blood pressure and the development of hypertension in later life. In a meta-analysis of 17 published studies, aortic PWV data from 15,877 subjects followed up for a mean of 7.7 years were compiled. Aortic stiffness was found to be a strong predictor of future cardiovascular events and all-cause mortality; an increase in aortic PWV by 1 m/s was associated with an increase in the risk of 14%, 15%, and 15% in CVD events, CVD death, and all-cause death, respectively. The results of this meta-analysis were confirmed recently with individual data from 17,635 subjects where the addition of PWV improved risk prediction by 13% (Figure 1).

While reimbursement from health care authorities and improvement of the cost-effectiveness of dedicated devices can lead to further utilization of PWV measurement, additional approaches that could aid integration into clinical practice have been offered. The most promising approach is a strategy that employs a simple clinical score (the SAGE score) that predicts high aortic PWV values based on widely available clinical variables (systolic blood pressure, age, glycemia, and estimated glomerular filtration rate) and can prioritize measurement of aortic PWV.

**Treatment and health care issues**

Pharmacological treatment is not easily available worldwide due to its high cost. Single-pill combinations that could also include statins or antiplatelets might provide a viable alternative as shown by recent studies in low-income countries to manage both high blood pressure and dyslipidemia. However, it is not only the lack of resources but also the limited number of physicians who are available to deal with the problem. An option to tackle this matter is the involvement of other specialists in the management of hypertensive patients, such as pharmacists or nurses. Extreme caution and care must be provided to ensure their proper training and education prior to dealing with patients to ensure best practice.

Another essential issue is the need for personalized medicine based on age, gender, and race; this has regrettably not been addressed in recent large randomized studies, leading to doubts on the exact treatment targets and the ideal treatment regimens. On the other hand, specific strategies must be implemented to identify risk factors for nonadherence. Nonadherence is the leading cause of uncontrolled blood pressure worldwide. Several solutions have been proposed, such as alternative treatment regimens (eg, single-pill combinations) or technological advancements (eg, mobile-based applications) to monitor and reduce nonadherence. Nevertheless,
none of these have been successful so far, stressing the need for additional means to overcome this problem.

Apart from pharmacological treatment, lifestyle modification is crucial in the management of hypertension. However, the ways to achieve a healthy lifestyle must be clearly defined. For example, the use of several different diets, like the DASH or the Mediterranean, must be integrated into one simple message regarding nutrition after validation in randomized studies. Similarly, clear strategies for weight reduction, as well as exercise prescription, must be advocated.

Finally, motivational incentives directed either to the patient or even to the physician are needed to counterbalance inertia related to the management of hypertensive patients. All these actions must be orchestrated by a well-organized and efficient health care system that is responsible for the dissemination of knowledge and provision of means to prevent, diagnose, and ultimately treat hypertension.

Conclusion

Hypertension is the number one cause of disability and death worldwide. Thus, it is necessary to implement several worldwide actions on prevention, diagnosis, evaluation, and treatment of increased blood pressure so as to tackle its grave repercussions on organs and prognosis. The concept of vascular aging might be a useful tool regarding initial evaluation, as well as therapeutic targets; however, further research is warranted. The idea of personalized medicine through technological advancements and mobile or tablet applications seems to be the future of hypertension management. Moreover, single-pill combinations have shown encouraging results, especially in

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**Figure 1** Number of subjects included in studies investigating the predictive role of aortic pulse wave velocity in Europe until 2018. The countries are colored based on the number of participants included in relevant studies.
low-income countries where the prevalence of hypertension is rising. Finally, it is clear that, the earlier these preventive efforts take place, the larger the gain will be regarding disease progression and disease-related outcomes.

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REFERENCES


