

Hypertension—A Public Health Challenge of Global Proportions

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This issue of *JAMA*, from illustrated cover to in-depth content, is dedicated to hypertension, a worldwide problem of enormous consequence. High blood pressure affects more than 1 billion people worldwide, and that number is increasing.



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Untreated or uncontrolled, hypertension is the single largest contributor to cardiovascular disease, causing stroke, heart failure, coronary artery disease, and kidney disease, and also is a major contributor to kidney disease. Progress over the last

several decades has led to increased understanding of the relationship between blood pressure and health outcomes and to the development of multiple antihypertensive therapies that reduce the risk. New knowledge carries with it a mandate to address the growing global epidemic of hypertension.

Hypertension continues to be the major risk factor for cardiovascular death in every region of the world. Even more striking, in 2010 high blood pressure emerged as the leading single risk factor for the overall global burden of disease, surpassing diseases like diarrheal illness and pneumonia.¹ Systolic blood pressure exceeding 140 mm Hg was estimated to be responsible for 14% of total deaths in 2015.² Yet it is now clear that cardiovascular risk begins at pressures much lower than 140 mm Hg. When considering individuals with systolic blood pressure of at least 110 to 115 mm Hg, regarded as the theoretical minimum risk level for blood pressure, an estimated 3.5 billion people are affected.² Of all individual risk factors quantified in the global burden of disease study of 2015, a systolic blood pressure of at least 110 to 115 mm Hg was the leading contributor to preventable death in the world.²

The rising prevalence of high blood pressure dominates the worldwide shift away from risks for communicable diseases in children toward those for noncommunicable diseases in adults. It parallels another disturbing trend: the transition of the burden of hypertension to countries with poorly developed health care systems, as described by Qamar and Braunwald in this issue.³ From 1975 to 2015, mean blood pressure decreased in high-income western and Asia Pacific countries, yet increased in East and Southeast Asia, South Asia, Oceania, and sub-Saharan Africa.⁴ In addition to population growth and aging of populations, multiple factors contribute to the increasing numbers of people with hypertension. Many of these result from the urbanization of societies and the detrimental changes in lifestyle that often follow: westernized di-

etary habits, excess dietary sodium, harmful alcohol intake, stress (although elusive to quantify), and sedentary lifestyle. The markedly increasing prevalence of obesity, diabetes, and hyperlipidemia alongside hypertension is more than coincidental; these disorders result from the same predisposing deleterious societal and lifestyle changes. Moreover, they also amplify cardiovascular risk.

Ironically, the reality that some of the best steps to prevent or treat hypertension—weight loss, sodium restriction, limited alcohol intake, and exercise—are inexpensive options that do not require drugs makes control of hypertension more difficult, not easier. These lifestyle changes are notoriously difficult to implement and sustain. Hampering effective control further is the fact that patients with hypertension are usually asymptomatic. In a final twist of irony, disagreement over long-awaited clinical guidelines published within the past year threatens to distract from their potential benefit.

The 2017 publication of the American College of Cardiology/American Heart Association (ACC/AHA) Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults⁵ has had important implications for the global prevalence of hypertension. Based in part on the results of the SPRINT trial,^{6,7} the guideline updated the 2003 Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7)⁸ and changed the threshold for stage 1 hypertension from 140/90 mm Hg or higher to 130/80 mm Hg or higher. Application of the new guideline resulted in an increased prevalence of hypertension in the United States from 31.9% based on JNC 7 to 45.6%.⁹ Comparable data indicated increased prevalence for China, from 25% to 50%; Japan, 36% to 58%; India, 28.9% to 42.9%; and South Korea, 30.4% to 49.2%.^{10,11}

The new US guideline has met with controversy related to the lower threshold for diagnosis. In contrast to the ACC/AHA guideline, the European Society of Cardiology and European Society of Hypertension (ESC/ESH) Guidelines for the Management of Arterial Hypertension¹² retain the 140/90 mm Hg threshold for stage 1 hypertension. In an international collaboration in this issue, Williams and Whelton, representing the ESC/ESH and the ACC/AHA, respectively, present the arguments supporting each of these guidelines.¹³ These authors also participated in an illuminating podcast that discusses the differences between the guidelines and their implications for the care of hypertension in Europe and the United States.¹⁴

The largest increases in hypertension prevalence resulting from the US guideline have occurred in the young: the

percentage of young men with the diagnosis of hypertension tripled with the lower threshold, and that of young women doubled. Most of these newly diagnosed patients have stage 1 hypertension, for which lifestyle treatments are recommended over medications on the basis of a low ASCVD (atherosclerotic cardiovascular disease) risk score. Two important research articles in this issue, discussed in greater detail in the Editorial by Vasani,¹⁵ assess the clinical implications of the 130/80-mm Hg threshold for the definition of stage 1 hypertension in young adults.^{10,11} In a US study by Yano et al,¹⁶ the ACC/AHA guideline hypertension criteria were applied to nearly 5000 young adults, 18 to 30 years of age, who were followed up for a median of 18.8 years for the development of hypertension and cardiovascular disease events. Compared with study participants with normal blood pressure (<120/80 mm Hg), the hazard ratios (95% CIs) for cardiovascular events for those with elevated blood pressure (\geq 120/80 mm Hg), stage 1 hypertension (\geq 130/80 mm Hg), and stage 2 hypertension (\geq 140/90 mm Hg) were 1.67 (1.01-2.77), 1.75 (1.22-2.53), and 3.49 (2.42-5.05), respectively. These findings indicate that stage 1 and stage 2 hypertension, as defined by the ACC/AHA, are associated with an increased risk of cardiovascular events.

In a similar study from South Korea by Son et al,¹⁷ nearly 2.5 million young adults aged 20 to 39 years were followed up for a median of 10 years for the development of hypertension and cardiovascular events. Using the ACC/AHA hypertension definitions, the researchers found that among men with stage 1 hypertension, compared with men with normal blood pressure, the adjusted hazard ratio for cardiovascular events was 1.25 (95% CI, 1.21-1.28). For women the comparable figure was 1.27 (95% CI, 1.21-1.34). These findings from a second country on the opposite side of the globe are consistent with those of the US study, providing further support for the ACC/AHA guideline definitions of hypertension.

As is emphasized in 3 insightful articles in this issue,¹⁸⁻²⁰ accurate measurement of blood pressure is critical. Single office measurements are not sufficient to make a diagnosis of hypertension and commit a patient to a lifetime of antihypertensive therapy. The authors underscore the importance of home blood pressure measurements and 24-hour ambulatory blood pressure monitoring, both of which add precision to the diagnosis of hypertension.

Given the magnitude and reach of the global problem of hypertension, it is imperative that dedicated control efforts at the population level intensify. Changes on a large scale must be shaped by contributions from arenas as disparate as

governmental and public health agencies, academia, medical associations, technology firms, and the food industry. Half of US adults have hypertension, and the vast proportion of those newly diagnosed with stage 1 hypertension should be educated about and treated with lifestyle measures. All patients will benefit from regular exercise, achieving and maintaining normal body weight, and reducing dietary sodium, but individual patient efforts will not succeed without vast support from health care systems. Public awareness of the dangers of hypertension and the potential benefits of effective preventive efforts must continue to expand. Once lifestyle modifications are maximized, treatment should be optimized for adherence, using once-daily, generic, and combination drugs whenever possible. Recent positive studies indicate that renal denervation may soon have a place in the therapeutic armamentarium, both for the treatment of resistant hypertension and also as a potential treatment for patients who cannot or would rather not take medications.²¹

Internationally, the WHO Global Plan of Action for the prevention of noncommunicable diseases provides policy guidance to attain 9 voluntary targets by 2025, including a 25% reduction in the prevalence of elevated blood pressure.²² On a national level, medical groups like the AHA and the American Medical Association are joined by multiple programs sponsored by the US Department of Health and Human Services to prioritize and support research and clinical efforts to reach blood pressure goals. The US Food and Drug Administration has issued guidance for the voluntary, gradual reduction in sodium content of foods to decrease excess salt consumption in the US population.

The traditional health care model of office visits for the control of blood pressure must be replaced. The control rate of hypertension in the United States has been hovering at a disconcerting 50%. Innovative systems of health care delivery are needed to improve quality of care and reduce costs. Inventive solutions will involve new technologies and models like algorithmic, non-physician-based treatment plans that rely on the automatic transmission of home blood pressure measurements, or hypertensive care delivered in unconventional settings. The management of hypertension on the population level must continue to strengthen as a team effort. More ambitious, innovative thinking should mobilize the international health care community to create sustainable solutions for controlling the problem of high blood pressure, one of the most deleterious health risk factors in nearly every country around the world.

ARTICLE INFORMATION

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