Systolic pressure is all that matters
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Blood pressure is usually expressed as two components—diastolic and systolic pressures. Systolic hypertension is much more common than diastolic hypertension, and systolic blood pressure contributes more of the huge global disease burden attributable to hypertension than does diastolic pressure. However, there has undoubtedly been confusion about the relative merits of targeting systolic versus diastolic blood pressure, which has led to poor recognition in the wider medical community of the importance of systolic pressure.

We propose a simplified view of hypertension for most affected patients—ie, those aged over 50 years—whereby the thresholds for the diagnosis and treatment of hypertension can be expressed in one dimension: systolic pressure. Distilling the risk imparted by high blood pressure into a single number will greatly assist in both the communication of an important public-health message to patients and policy makers and in the simplification of treatment targets and thresholds for the physician. The minds of drug innovators will also be focused to develop better ways to treat high systolic pressure. At the moment, high blood pressure in most affected people remains inadequately treated and modern drug development remains focused on the wrong target.

Observational studies show clear associations between raised systolic or diastolic blood pressure and the risk of cardiovascular disease. However, what these studies have not emphasised is the changing burden of disease attributable to systolic pressure versus that attributable to diastolic pressure. Blood pressure profiles change with increasing age. Systolic pressure rises with age; by contrast, diastolic pressure increases until around age 50 years and falls thereafter—at a time when the risk of cardiovascular disease begins to rise. As a consequence, there is an increased prevalence of high systolic pressure over age 50 years and an almost total disappearance of high diastolic pressure (figure). Since more than 75% of people with high blood pressure are over age 50 years, the burden of disease is mainly due to systolic pressure. The use of diastolic pressure for diagnosis and risk stratification in our ageing populations has thus become illogical.

In younger people, higher systolic and diastolic blood pressures are mainly caused by an increase in peripheral vascular resistance generated by functional and structural narrowing of the resistance arteries and arterioles. However, as age advances, structural damage and disease in larger conduit arteries becomes a more important determinant of blood pressure. Large artery changes result in arterial stiffening and a loss of vascular compliance, thereby reducing the buffering capacity of the arterial system, causing a progressive rise in systolic pressure with age, accompanied by a fall in diastolic pressure and a widening in pulse pressure. Increased pulse pressure is therefore indicative of large artery disease and is also associated with increased cardiovascular risk. However, assessment of systolic pressure is sufficient to capture this component of risk; since there is hardly ever a situation in which pulse pressure is increased in the context of a normal systolic pressure. Importantly, these large artery structural changes could be irreversible and render the continuing rise in systolic pressure more difficult to control.

Textbooks of physiology emphasise the constant diastolic load to which the vascular walls are subjected, and historically this focus on diastolic pressure has determined the use of this measure for therapeutic decision making and also as a criterion for inclusion in randomised trials of treatments to lower blood pressure. Simultaneously, systolic pressure was largely ignored and considered to be a part of the natural ageing process, as exemplified by the popular mantra that a systolic blood pressure of 100 plus an individual’s age was to be expected. Illustrative of the eminence of diastolic pressure, as recently as the late 1990s, the first and only major hypertension trial designed to define the optimum treatment target for hypertension focused on diastolic rather than systolic pressure targets.

The emergence of systolic hypertension as the major risk factor relates to two major changes: people are living longer and people with hypertension are generally being identified and treated earlier. As a result, severe diastolic hypertension is becoming less of a problem while...
simultaneously exposing the under-treatment of raised systolic blood pressure. Across the world, the age-related rise in systolic blood pressure is linear from age 30 to 40 years, and slightly steeper for women than for men, except in southeast Asia, where the age-related increase is the same in both sexes. By contrast, diastolic pressures fall progressively from age 50 years. Thus, as the demographics of populations shift towards older age, the population burden of cardiovascular disease attributable to blood pressure will be almost entirely related to systolic pressure. This conclusion is of course based on the hypothesis that the risk of cardiovascular disease is related to high systolic pressure rather than low diastolic pressure over age 50 years. This hypothesis has been tested in trials of older patients with predominantly isolated systolic hypertension. Treating this condition lowers both systolic and diastolic pressures. If the already low diastolic pressures were the key risk factor in such patients, further lowering of diastolic pressure would be expected to enhance risk and certainly not reduce it. Trials to lower the blood pressure of patients with isolated systolic hypertension have unequivocally confirmed the safety and impressive cardiovascular benefits of lowering systolic blood pressure. These trials have not shown that a resultant fall in diastolic pressure would impart harm or offset the benefit of systolic blood pressure reduction. On the contrary, the cardiovascular benefits—and in some cases mortality reduction—associated with treatment of systolic pressure were substantial.

In trials of treatments for blood pressure and in national surveys, a consistent finding has been that systolic pressure is much more difficult to control than is diastolic pressure and invariably requires more drug therapy. In these studies, control rates for diastolic pressure approach 100%; by contrast, systolic pressure control is achieved in less than 50% of patients. Thus, targeting diastolic pressure leaves most patients with uncontrolled systolic pressure. By contrast, if the focus of our treatment was on systolic pressure, there would hardly ever be a circumstance when diastolic pressure was not controlled.

We believe that redirecting our clinical focus exclusively towards systolic pressure in people aged over 50 years is now appropriate and important for four reasons. First, systolic blood pressure is more easily and accurately measured than is diastolic pressure, and is a better predictor of risk. Indeed, diastolic pressures are often normal or low in the highest risk patients. Second, communication of the concept of hypertension as two different numbers has left many patients confused about the relative importance of systolic versus diastolic blood pressure. A public-health campaign focused on a single number would be easier to communicate and, for public-health initiatives on this scale, simplicity and pragmatism are important. Third, many physicians have also been confused by conflicting messages about diastolic and systolic pressure. Many still use diastolic pressures to guide their clinical management decisions. Lastly, to focus public-health messaging on a single number for those patients aged over 50 years has the potential to dramatically improve the treatment and control of systolic blood pressure and further reduce the associated cardiovascular morbidity and mortality.

The risk of cardiovascular disease rises continuously as systolic pressure increases from 115 mm Hg. On the basis of thresholds for intervention used for trials of blood pressure treatment, most national and international guidelines advocate a target for systolic pressure treatment of below 140 mm Hg, with an even lower therapeutic goal of below 130 mm Hg for patients with diabetes and those at increased cardiovascular risk for other reasons. These therapeutic targets for systolic pressure are a reasonable consensus based on an assessment of the available evidence. However, in patients with uncomplicated high blood pressure, there is a lack of evidence from prospective randomised clinical trials to define unequivocally the optimum target for systolic pressure treatment. Such trials are much needed and perhaps our call for a renewed focus on systolic pressure will provide a catalyst for them to be designed. Although debates are still ongoing about the optimum targets for systolic treatment, these arguments should not detract from the need to focus on systolic pressure as the basis for treatment and to monitor the effectiveness of such treatment.

We acknowledge that we have focussed here on individuals aged 50 years or more. Among individuals under age 40 years, as many as 40% of patients with high blood pressure have isolated diastolic hypertension, and between ages 40 and 50 years, such disease accounts for a third of hypertension (figure). Thus, in patients younger than 50 years, a continued emphasis on both diastolic and systolic pressures remains appropriate. However, this much smaller group of patients should not dilute the key message regarding the overwhelming importance of systolic pressure for most patients with hypertension.

Blood pressure should always be viewed in the context of an individual’s overall cardiovascular risk and many patients at high risk will require more than just means to lower blood pressure to optimise their risk reduction. However, we wish to shift focus from diastolic to systolic pressure to both define the risk associated with hypertension and the treatment target. We believe that systolic blood pressure should become the sole defining feature of hypertension and key treatment target for people over age 50 years. Even for those younger than 50 years, although diastolic pressure should always be controlled, systolic pressure should always be the main target. This approach will produce adequate control of diastolic pressure for all but a few patients, contrasting starkly with the existing emphasis on diastolic pressure, which frequently leaves those most at risk with uncontrolled systolic blood pressure. A renewed focus on
systolic pressure will simplify the message for practitioners and for patients, will improve awareness and understanding of treatment objectives, and will ultimately lead to more effective treatment of high blood pressure. Such an initiative would have major public-health implications for the prevention of blood-pressure-related cardiovascular disease. 3,4

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References