

Is systolic blood pressure all that matters?

Peter Sever argues that abandoning diastolic measurements will improve control of blood pressure, but **Eoin O'Brien** thinks that we should change the method of measurement instead



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Peter Sever head of department, International Centre for Circulatory Health, Imperial College London, London W2 1NY
p.sever@imperial.ac.uk

YES Tradition invariably shackles progress: for almost 100 years the focus of blood pressure measurement has been on diastolic pressure. Now despite persuasive findings from observational studies and the results of trials of interventions to lower systolic pressure, we remain unable to accept the new model in which systolic pressure is pre-eminent. A continuing focus on diastolic pressure throughout adult life is arguably the most important factor contributing to poor control of blood pressure, high residual cardiovascular risk, and global morbidity and mortality.

As recently as 2004, only 5-15% of people in Europe met the guideline targets for blood pressure (<140/90 mm Hg), with the proportion for high risk groups being even smaller.¹ The switch in emphasis to the importance of systolic blood pressure is relatively recent, but many doctors who have achieved diastolic control in their patients still fail to modify treatment further to achieve systolic targets.²

Eoin O'Brien professor of molecular pharmacology, Conway Institute of Biomolecular and Biomedical Research, University College Dublin, Dublin 4, Ireland eobrien@iol.ie

NO Since Riva-Rocci and Korotkoff gave us the technique for measuring blood pressure over a century ago, we have landed men on the moon, encircled Mars, invented the automobile and aeroplane, and most importantly revolutionised the technology of science with the microchip. Why, we might ask, has medicine ignored scientific evidence for so long and perpetuated a grossly inaccurate measurement technique in both clinical practice and hypertension research?¹ And now we have a call from eminent clinical scientists to modify the technique by abandoning measurement of diastolic blood pressure in people over 50 years old.

In fairness there would be an attraction to the argument if we were dependent solely on conventional measurement of blood pressure since the technique is grossly misleading. Firstly, it creates the phenomenon of white coat hypertension, which affects as many as 20% of patients with hypertension diagnosed

If at the time of the switch to the pre-eminence of systolic pressure we had abandoned diastolic pressure measurement, as I have advocated,³ the new focus on systolic pressure as a guide to therapeutic decision making would have been more successful and in all probability have led to better rates of control.

Problems with diastolic pressure

Preoccupation with diastolic pressure as the basis for the conduct of observational studies and intervention trials seems to have been an accident of history. An editorial insertion to a posthumous edition of MacKenzie's classic book on the heart and circulation, published in 1926,⁴ led to the widespread misconception that increased diastolic pressure resulted from raised peripheral vascular resistance but that high systolic pressure was an indicator of a strong heart. As a result, generations of doctors embraced an all too simplistic explanation of blood pressure and were subsequently misguided in their assessment and treatment of patients with hypertension.

Systolic pressure rises with age but diastolic pressure, which rises with age to around 50 years, thereafter falls. The prevalence of systolic hypertension, due to increased

by conventional measurement.² Secondly, it fails to detect hypertension in some 10-20% of the population, which if even conservatively estimated at 5% translates into as many as 10 million people in the US.³ Thus the diagnosis of hypertension with conventional blood pressure measurement may be incorrect in as many as a third of all patients. Conventional blood pressure measurement also gives no indication of nocturnal hypertension, which is one of the most sensitive predictors of cardiovascular events.⁴

Advantages of ambulatory techniques

We need to embrace technological advances, especially ambulatory blood pressure measurement, to improve the deplorable level of blood pressure control in our societies. The technique not only gives us an insight into blood pressure behaviour over 24 hours, but also shows the appalling inaccuracy of

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conventional blood pressure measurement, whether systolic or diastolic, automated, or auscultatory. Measurement of nocturnal blood pressure is important because recent outcome studies show that control of both daytime and

rigidity of large arteries,⁵ is high in people older than 50 years, and as age advances systolic pressure becomes a far more important determinant of future cardiovascular events.⁶ Thus therapeutic decisions should be based on systolic and not diastolic pressure, particularly in the light of the strong evidence for the benefits of reducing systolic pressure observed in two trials of isolated systolic hypertension; stroke and coronary events were reduced by active treatment by about 40% and 25%, respectively.^{7,8}

On the other hand, when systolic pressure is at the lower end of the continuum (for example <140 mm Hg) the risks associated with raised diastolic pressure are small. So in the absence of systolic hypertension, how important is isolated diastolic hypertension? Over the age of 60 years isolated diastolic hypertension is rare.⁹ Although in younger people it occurs more commonly, its contribution to the disease burden is small. In the Health Survey for England, 2006, isolated diastolic hypertension was present in 1% and 2.7% of the untreated population aged 16-34 and 35-54 years, respectively (E Falaschetta and

N Poulter, personal communication), and in prospective studies involving 12.7 million person years of risk,¹⁰ raised diastolic pressure in isolation (>90 mm Hg) accounted for only 104 (0.9%) of all stroke deaths and 392 (1.2%) of all coronary deaths (S Lewington, personal communication). No intervention trials have been, nor could be, sufficiently large to evaluate the benefits of blood pressure lowering in isolated diastolic hypertension.

Treatment decisions

Isolated diastolic hypertension at a younger age can herald the subsequent development of combined systolic and diastolic hypertension, and its retention as a marker of future cardiovascular disease in younger subjects may therefore be justified. However, there is little justification for its retention as a determinant of treatment decisions. Its measurement is less accurate, and it is less powerful than systolic blood pressure as a predictor of future events; when both systolic and diastolic pressure are raised, systolic pressure should guide therapeutic decisions. Few doctors will treat isolated diastolic

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night-time systolic and diastolic blood pressure is crucial to prevent stroke.¹⁵

Ambulatory measurement also provides indices of measurement dependent on both systolic and diastolic pressure, such as pulse pressure and the ambulatory arterial stiffness index, which may provide valuable information on arterial stiffness well in advance of the onset of stroke and heart attack.⁶ However, the greatest advantage of ambulatory measurement has been made possible by advances in telecommunication that allow us to transmit and store data centrally. This facilitates an assessment of the prevalence of differing forms of hypertension, the incidence of resistant hypertension, and the status of blood pressure control in the community.¹

Blood pressure control

Treatment of hypertension is largely wasted unless blood pressure is controlled. Treated patients with uncontrolled blood pressure have a cardiovascular risk only modestly less than that of untreated individuals.⁷ Yet scarcely a third of patients with hypertension in the United States achieve control⁸ and in the UK the figure is only just over 20%.⁹ These figures may not be quite as bad as they seem, however, because they are based on inaccurate

conventional measurements rather than automated measurement over 24 hours. In Spain, for example, the establishment of a national network of ambulatory measurement in primary care has shown that conventional measurements were about 16/9 mm Hg higher than ambulatory measurements in low to moderate risk patients, with a greater difference in high risk patients. Blood pressure control based on ambulatory measurement was more than twice as good as control based on conventional measurement.¹⁰

Need for action

It is estimated that the proportion of the population aged 65 and over in Europe will increase from 20% in 2000 to 35% in 2050.¹¹ The prevalence of hypertension increases with advancing age to the point where more than half of people aged 60 to 69 years old and about three quarters of those aged 70 years and older have hypertension.¹² If we are to avert the burden of stroke and heart failure in an increasingly ageing population we need to change our practice. We have adequate drugs to control blood pressure; in the light of evidence on the daunting consequences of uncontrolled hypertension we must no longer quibble about simplifying measurement but rather marry the technolo-

gies of automation and telecommunication to ensure that we achieve blood pressure control without delay.

Following my proposal to abandon measuring diastolic pressure in 1990,³ a large general practice in South Wales implemented a policy of treatment decisions based solely on systolic pressure. Over the following four years, repeated practice audits showed blood pressure control to targets increased by more than 20% in people over 60 years and by more than 30% in those less than 60 years (G Elwyn, personal communication). I therefore rest my case.

The all important message to doctors and patients is for a renewed focus on systolic blood pressure and its control, without which there will remain unacceptable levels of poorly controlled hypertension and a high prevalence of largely preventable cardiovascular morbidity and mortality.¹¹ As Geoffrey Rose said “One sometimes wishes that Nikolai Korotkoff had never described the fourth and fifth phases.”

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Rather than abandon diastolic pressure, I would advocate that every patient with suspected hypertension should have both systolic and diastolic pressure measured over 24 hours to confirm or refute the diagnosis of sustained hypertension. And every patient with uncontrolled hypertension, whether systolic, diastolic, or both, should have ambulatory blood pressure measurement repeated until 24 hour control of blood pressure is achieved.

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