



Cardiovascular risk in women with high normal blood pressure
Effect of pay-for-performance on management of high blood pressure
Rapid postnatal growth predisposes to high blood pressure in early childhood

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Women with high normal blood pressure have a higher risk of cardiovascular death, myocardial infarction or stroke than women with normal blood pressure (Conen D, Ridker PM, Buring JE et al. *BMJ* 2007; 335: 432-440). In a women's health study conducted in the USA, over 39,000 healthy women aged 45 years or older were classified into four blood pressure categories: optimal (<120/75 mm Hg), normal (120-129/75-84 mm Hg), high normal (130-139/85-89 mm Hg) or established hypertension (\geq 140/90 mm Hg or taking antihypertensive medication) and were followed up for at least 10 years. At 10 years, the age-adjusted cardiovascular event rate was found to be 1.6/1000 person years among women with normal blood pressure, 2.9/1000 person years in women with high normal blood pressure and 4.3/1000 person years among women with baseline hypertension. In total, 30.1% of the women who entered the study without a diagnosis of hypertension developed incident hypertension during follow up. At 10 years, 14.8% of women with optimal blood pressure at entry had developed hypertension, compared with 34.0% of women with normal blood pressure, and 64.2% of women classified as having high normal blood pressure at baseline. Furthermore, women who developed hypertension during the first 4 years of follow up had a 56% increased risk of a major cardiovascular event in the last 6 years of follow up, compared with women who did not develop hypertension in the first 4 years. The study authors noted that women who progressed to hypertension needed to be identified early, as their risk of an adverse cardiovascular outcome was increased shortly after diagnosis had been made.

Expert comment

These results should not surprise. The continuous positive relationship between blood pressure and major cardiovascular events has been known for many years, just as it has for cholesterol. Ideal blood pressure levels for most are 115 mmHg systolic or less and the findings reported here again challenge our use of the terms "high normal blood pressure" and our conventional definition of "hypertension". The paper highlights the role that blood pressure plays in the cardiovascular risk of most people and the need to consider the possible impact of blood pressure in both hypertensive and non-hypertensive patients. However, important as it is, blood pressure is only one risk factor. Absolute risk assessment, based on the intensity of a range of independent cardiovascular risks, allows for a better and more informative estimate of risk. The paper delivers another important message concerning the rise in blood pressure with age. Population studies have shown that this rise is closely related to excess salt consumption, low intakes of fruits and vegetables, physical inactivity and weight gain. These findings underscore the importance of lifestyle in vascular disease causation and emphasise the potential for effective lifestyle interventions. Information on changes relating to these lifestyle determinants of risk over the ten years of this study would have been fascinating.

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Effect of pay-for-performance on management of high blood pressure

Pay-for-performance has a modest but significant effect on the monitoring and treatment of high blood pressure in general practice (Doran T, Fullwood C. *Curr Hypertens Rep* 2007; 9: 360-367). The Quality and Outcomes Framework (QOF) in the United Kingdom is a pay-for-performance program which contains specific targets for the measurement and treatment of high blood pressure, and provides financial incentives for family practitioners caring for 6 million patients with hypertension. Analysis of data from the QOF in the first year of its operation found that rates of achievement were generally very high for the quality and outcomes indicators concerned with the treatment of high blood pressure. However, the QOF was introduced against a background of improving quality of care for chronic diseases driven by previous quality initiatives. As such, the study authors noted that it was difficult to assess how much of the high achievement was attributable to pay-for-performance, and how much to the quality improvement initiatives that preceded it. Furthermore, they noted that some of the quality and outcomes indicators for high blood pressure under the QOF were not very demanding. For example, target blood pressure levels ($\leq 150/90$ mm Hg) were less demanding than those recommended by most treatment guidelines. The authors concluded that the potential of pay-for-performance to improve the management of high blood pressure may depend on the existing quality of care, and may need to be combined with other quality improvement interventions to achieve better outcomes.

Expert comment

This study examines the potential for financial incentives to improve the management of high blood pressure in general practice in the UK. While the findings are striking, the difficulty is in applying the results to a different health system with different characteristics. GPs under the fee-for-service system in Australia have a number of options for increasing their incomes (such as seeing more patients or offering more lucrative procedures) that are not open to their salaried counterparts in Britain. The incentive-based intervention found to work well in the UK may therefore have a much more limited effect in Australia – because it would be competing with many other options for income generation. There is, however, no doubt that the introduction of financial incentives can fundamentally shift professional norms because it encourages doctors to shape their clinical care around payment. It is important to note that this can have unintended implications for other areas of activity. In particular, those areas that lack such incentive may become neglected. Non-financial strategies, like greater monitoring of practice patterns, are alternates for improving the quality of care and may do so with less collateral damage. Therefore, for a policy maker, the evidence that this financial incentive had an ‘effect’ on the blood pressure target outcome really provides only part of the picture. In considering the introduction of financial incentives, policy makers must fully understand the broader question of what it is that motivates GP behaviours in their particular setting. Once that is established, financial measures to influence behaviours, must like any others, be evaluated on the basis of a rigorous assessment of their costs, benefits and harms.

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Rapid postnatal growth, but not birth weight, is associated with an increased risk for high blood pressure in early childhood (Hemachandra AH, Howards PP, Furth SL *et al. Pediatrics* 2007; 119: 1264-1270 & Min JW, Kong KA, Park BH *et al. J Hum Hypertens* 2007; 21: 868-74). A study involving 102 Korean children followed up at 3 years of age found that current weight ($r=0.41$) and weight gain from birth ($r=0.39$), but not birth weight, were correlated with systolic blood pressure (Min *et al.*, 2007). Children with a higher current weight and higher weight gain from birth had the highest blood pressure. However, the authors noted that despite the lack of a direct association between birth weight and blood pressure, accelerated postnatal growth which is a risk factor for higher blood pressure in early childhood is more likely to occur in children with a low birth weight. In a larger cohort study in the USA involving over 29,000 children, those who were small for gestational age did not have an increased risk for high blood pressure at 7 years of age. However, children who crossed weight percentiles upward during early childhood did demonstrate an increased risk for high blood pressure, regardless of birth weight (Hemachandra *et al.*, 2007). The authors concluded that encouraging rapid weight gain in infancy needs to be carefully considered in light of the implications of the increased risk for high blood pressure in early childhood.

Expert comment

An individual's growth experience *in utero* has been implicated as a determinant of their later risk of developing cardiovascular and other chronic diseases. This hypothesis is known as the "fetal origins of adult disease." The idea stemmed from observations that low birth weight (used as a surrogate marker of poor fetal growth) was associated with increased blood pressure and other cardiovascular risk factors in adulthood. However, support for the hypothesis is far from universal and critics have argued that these associations may be due to other unaccounted for risk factors such as low socio-economic position. Compared with individuals from a less disadvantaged background, a low socio-economic position is associated with both a greater likelihood of being born low birth weight as well as a greater risk of developing chronic disease in older age. In the Min and Hemachandra papers summarized here, it is current body size and not birthweight that is most strongly related to blood pressure, with some evidence that raised blood pressure is particularly common among those children who were born small but who rapidly gained weight in the first few years of life. An important limitation of these studies is the absence of information regarding the food intakes of the children – for example, it is possible that greater intakes of dietary salt among those children who gained the most weight could explain the association with raised blood pressure. Whatever the underlying mechanism for the elevated blood pressure levels, these findings highlight the importance of feeding children a well-balanced diet appropriate to their physical activity levels. More appropriate nutrition for children would also go some way towards curbing Australia's epidemic of childhood overweight and obesity.

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