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Editorial Commentary

One Step Further Toward a Targeted Screening Program

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The old controversy on universal screening for high blood pressure in childhood has intensified since the US Preventive Task Force recommended not to screen for hypertension in asymptomatic children in 2013.[1] The reasoning at the time was that "the current evidence is insufficient to assess the balance of benefits and harms in asymptomatic children and adolescents to prevent subsequent cardiovascular disease in adulthood."[1] Furthermore, the prevalence of hypertension in childhood was viewed as very low and the risk of false-positive results as too high.[1] This view contrasts the recommendations by many medical experts and medical societies. Only recently the European Society of Hypertension published updated guidelines and recommended screening for high blood pressure starting at the age of 3 years, with a reevaluation in children with prehypertensive values after 1 year.[2] The argument that was put forward, considering the noninvasive, noncostly, and easy to perform measurement, is that "lack of evidence does not necessarily justify inaction."[2]

The article published in this issue of *Hypertension* by Hao et al[3] adds to the evidence and supports arguments for blood pressure screening in youth. Adopting a new approach to identify children who will develop high blood pressure in adulthood, the authors applied latent class analyses to identify clusters of individuals who develop similar blood pressure trajectories from childhood into young adulthood using data from the Georgia Stress and Health Study, a longitudinal study on the development of cardiovascular disease. The analyses were based on a minimum of 3 up to 16 blood pressure measurements per individual over a 23-year study period and provide prevalence data, differentiation of risk groups, and long-term effects of high blood pressure.

Prevalence of elevated blood pressure may be low in childhood compared with other cardiovascular risk factors, such as being overweight. However, the cutoff for hypertension in childhood is the 95% percentile of blood pressure by sex, age, and height, thus in theory population prevalence should be ≈5%. Five percent of the population can surely not be considered irrelevant. Literature presents a different picture, providing lower prevalence of hypertension in study populations of 0.8% to 4.5%[4] when data rely on multiple blood pressure readings. Far higher prevalence is reported when studies report 1-time measurements.[4] The higher prevalence can be explained with a high rate of false-positives and white coat hypertension, both strong arguments against 1-time screening, the lower rates point to a more complex issue. The primary question is how representative study populations and reference values actually are? It is common to use the US reference values based on the Fourth Report by the National High Blood Pressure Education Program Working Group on High Blood Pressure in Children when assessing high blood pressure in children and adolescents.[5] The data mainly stem from the National Health and Nutrition Examination Survey from 1999 to 2000. The more recent German and Iranian blood pressure reference data in childhood underline the necessity of establishing population-specific reference values, as well as defining a healthy population when developing reference values.[6,7] Second, the question is where to set the cutoff? The article by Hao et al[3] presents differences in prevalence increase over time depending on the trajectory group ranging from 42% hypertension in young adulthood in the high to 1.8% in the low blood pressure increase group, despite all participants being normotensive at the beginning of the study.[3] These results imply that cutoffs should be defined on the basis of long-term development of hypertension and its health consequences.

Experts agree on the high individual variability of blood pressure and risk of misclassification, but this also holds true for adult blood pressure measurements. The reality of 1-time readings because of the typical screening settings in childhood, like school health services or well-child doctor visits, can hardly be changed. A potential solution lies in the assessment of blood pressure throughout childhood to capture and to diagnose the persistence or development of elevated blood pressure. Previous studies have demonstrated that high blood pressure in childhood tracks into adulthood and is a predictor of adult hypertension[8]; however, this is not true for all. A more targeted approach in screening has been proposed taking cardiometabolic risk factors, such as overweight or parental history into account.[9]

The present article by Hao et al[3] offers such a targeted approach. The authors identified 3 separate trajectories with different increase of blood pressure over time. The high increase trajectory was more often found in men and individuals of African American ancestry, higher body mass index or lower socioeconomic status. The generalizability of the trajectories and the associated characteristics to other populations needs to be confirmed in further research.

Only few studies, mainly in army recruits, have been able to investigate long-term health risks of adolescent high

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blood pressure and yield an increased risk of adult cerebrovascular disease and mortality.[10] Given that children cohorts investigating cardiovascular health have grown up to become adults,[11] data on long-term impact of childhood blood pressure on cardiovascular end points will become increasingly available. Until then intermediate end points, such as carotid intima media thickness or left ventricular hypertrophy, will need to serve the purpose. A considerable percentage of children with elevated blood pressure show increased left ventricular hypertrophy.[12] The consortium of cardiovascular children cohorts observed that persistent elevated blood pressure was associated with higher increase of the carotid intima media thickness in adults compared with children without high blood pressure or with children in whom high blood pressure normalized across the observation period.[13] Indirectly, this result also points to a potential for prevention. The association with carotid intima media thickness, an accepted subclinical indicator of atherosclerosis, has been seen in numerous cross-sectional studies[14] and the potential of regression has been demonstrated.[13] Although the evidence of the absolute and relative importance of childhood blood pressure for cardiovascular end points is still rare, evidence for early changes to the cardiovascular system and long-term cardiovascular impact is mounting.

The presented study by Hao et al[3] is even more valuable as the authors add to the evidence of the long-term health impact. They assessed the association between the different trajectories and objective intermediate outcomes of cardiovascular diseases: carotid intima media thickness and left ventricular hypertrophy. The results imply changes to function and structure of the cardiovascular system because of elevated blood pressure already at young age, especially in the high increase trajectory group.

Whichever stand one takes on the question of screening, authors generally agree on the need to further investigate childhood factors of cardiovascular risk prediction and long-term health. The approach by Hao et al[3] may facilitate the development of a targeted screening process and offer an additional indicator for clinicians to identify individuals at increased risk of end-organ damage. Certainly, there remains more work to be done. The reliability of the trajectory assignment based on a few readings must be investigated, as well the time points at which blood pressure measurements are the most predictive of the trajectory and health impact. In addition, it seems worthwhile to define reference values and trajectories in different ethnic populations and to move from single risk factor analyses to risk cluster analyses in research, screening, and treatment, based on the knowledge that lifestyle risks tend to cluster, interact, and modify risk associations.

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Disclosures

None.

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