

## Hypertension in teenagers To screen or not to screen? To treat or not to treat?

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The increasing prevalence of hypertension in children and adolescents has become a public health problem.

Despite this fact, there is a huge difference in approaching this issue in Europe and in North America.

In 2013, the US Preventive Services Task Force concluded that the “current evidence is insufficient to assess the balance of benefits and harms of screening for primary hypertension in asymptomatic children and adolescents to prevent subsequent cardiovascular disease in childhood and adulthood” [1].

On the other hand, the Writing Group of the 2016 European Society of Hypertension Guidelines for the Management of High Blood Pressure in Children and Adolescents has concluded that lack of evidence does not necessarily justify inaction and that opportunistic blood pressure (BP) screening in children is associated with minimal costs and does not include invasive and expensive tests. The consensus of the current guidelines is that BP should be measured in children from the age of 3 years [2]. In normotensive children and adoles-

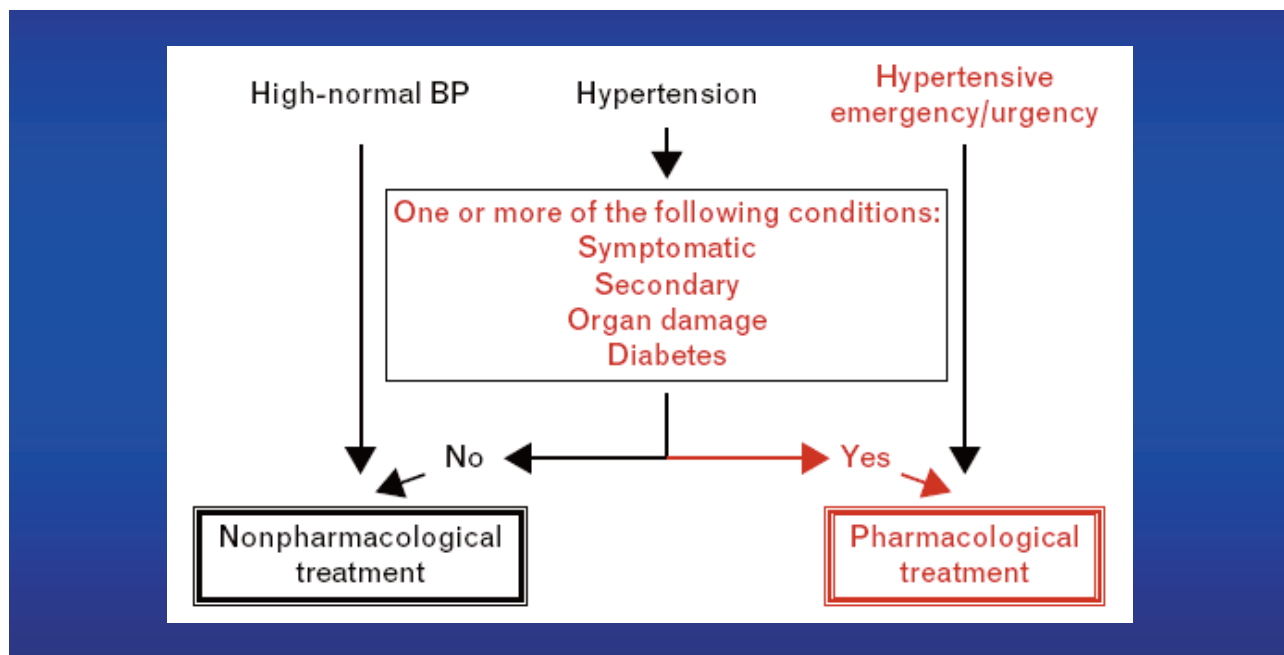
cents, re-evaluation is recommended every 2 years, and every year in those with high-normal BP and no organ damage.

The group of teenagers (ages 13 to 19 years) is split, according to the definition of hypertension, into 2 subgroups. Until the age of 15, hypertension is defined as a BP  $\geq$  95th percentile specific for sex, age, and height. As there is a lack of data in Europe, we have to use BP percentiles for boys and girls adapted from the Fourth Report of the US Task Force [3]. The definition of hypertension for teenagers aged 16 to 19 years is based on absolute BP values, which are identical to those of the adult population (i.e.,  $\geq$  140/90 mmHg). In all young individuals labeled as hypertensives, it is of utmost importance to rule out secondary causes of hypertension and search for organ damage (Figure 1); while lifestyle measures are recommended to all hypertensive individuals, additional drug treatment should be initiated in those with secondary hypertension and those with organ damage.

Prevalence of hypertension in teenagers is lower than in adults; in Europe, it is most frequently reported to be around 2% and increases markedly with body weight. Essential hypertension is the most common type of hypertension in teenagers; however, secondary hypertension is more common than in adults.

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**Figure 1.** When to initiate antihypertensive treatment. One or more of the conditions listed in the box are required for the start of antihypertensive drugs. Persistent hypertension, despite nonpharmacological measures, requires initiation of antihypertensive drug treatment (reproduced from ref. 2).

Correct and precise BP measurement is absolutely essential for establishing the diagnosis; auscultatory devices are preferred. Proper cuff size should be selected. Cuff inflation should be performed with caution as cuff overblowing might be a painful stimulus increasing BP. 24-hour ambulatory and home BP monitoring are complementary techniques used both in the process of establishing diagnosis and during treatment. For teenagers until the age of 16, there are specific reference values (percentiles for sex, age, and height) obtained from different European populations [4,5].

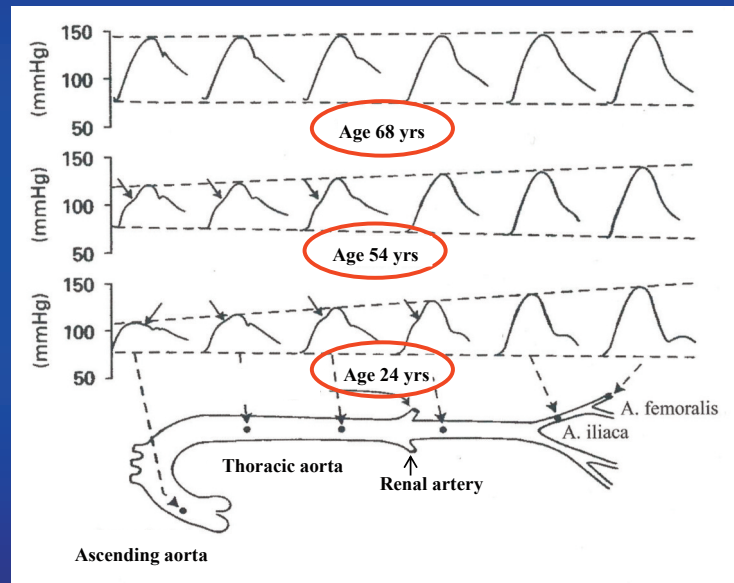
Isolated systolic hypertension, as measured over the brachial artery, is very common in teenagers. Mean and diastolic BP are rather constant throughout the arterial tree but systolic BP varies with peripheral higher than central or aortic systolic BP. This phenomenon differs significantly in children whose systolic BP amplification is substantial, with a mean of approx. 20 mmHg, almost twice as in adults.

Interpretation of isolated systolic hypertension in young individuals is controversial. Some authors believe that it is a “spurious”, presumably benign condition characterized by a high peripheral systolic BP with normal central systolic BP; it has been attributed to exaggerated pulse pressure amplification from central to

peripheral arteries because of increased vascular elasticity [6]. Pressure waves in large arteries of individuals of different ages are shown in Figure 2.

Opponents state that isolated systolic hypertension in young individuals is an abnormal condition characterized by increased systolic volume and/or increased aortic stiffness [7]. In more than 10,000 Harvard University students (aged approx. 19 years), higher systolic BP (> 130 mmHg), ponderal index (weight for height), and cigarette smoking during college years, all predicted nonfatal stroke during the follow-up period of 26 to 50 years [8]. Another study of more than 1.2 million Swedish male military conscripts (aged approx. 18 years) followed up for a median of 24 years showed that both systolic and diastolic BP were associated with increased cardiovascular mortality [9].

24-hour ABPM may provide additional information in isolated systolic hypertension regarding intervention. However, drug treatment is so far not recommended unless target organ damage is present. Research is needed to identify factors determining systolic amplification as well as interventions having different impact on central and peripheral systolic BP.



**Figure 2.** Pressure waves in large arteries in individuals of different age (adapted from McDonald’s blood flow in arteries. Nichols WW, O’Rourke MF. Theoretical, experimental, and clinical principles. London: Edward Arnold; 1998).

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