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Review Article

A Closer Look at the Latest United States and European Pediatric Hypertension Guidelines and its Impact on Local Practice

Lourdes Paula R. Resontoc[1], Dolores D. Bonzon[2]

[1]Department of Pediatrics, College of Medicine, University of the Philippines Manila-Philippine General Hospital, Manila, Philippines, [2]Department of Physiology, College of Medicine, University of the Philippines Manila, Philippines

Abstract

Background: For lack of the Philippine consensus on diagnosis, evaluation, and management of childhood and adolescent hypertension (HTN), local practice follows the United States (US) and European guidelines. **Aim:** The latest US and the European guidelines were examined for its potential benefits, limitations, and impact on local practice. **Results:** Essential differences and similarities between these two guidelines were recognized. Identified gaps include discrepancies in the diagnosis and classification of HTN among adolescents, including the age cutoff (13 vs. 16 years old). The applicability of the 24-h ambulatory blood pressure (BP) monitoring – although more superior in terms of BP information – is not practical at present. The European Society of HTN (ESH) recommendation for home BP monitoring is more feasible to implement. Adoption of the more rigorous screening and follow-up schedules of the American Academy of Pediatrics and the extensive diagnostic workup of the ESH guidelines are essential aspects useful to local practice. These strategies can minimize both over- and under-diagnosing pediatric HTN. The non-pharmacologic and pharmacologic treatment approaches of both guidelines are practical and feasible to implement. The optimal BP targets, especially those of high-risk populations to prevent excessive cardiovascular morbidity and mortality, are ideal. **Conclusion:** Due to the limitations of both guidelines in its applicability to local practice, the formulation of a country-specific BP consensus guideline is ideal. Modeling some parts of the recommendations in the screening, workup, and treatment that can contribute to best practice and outcomes is a goal.

Key words: Adolescents, american academy of pediatrics, european society of hypertension, filipino children, impact

Background

The tracking phenomenon of childhood hypertension (HTN) is widely recognized. Large population-based longitudinal studies showed that a hypertensive child would carry on to become a hypertensive adult.[1] Thus, early recognition and intervention while still at the pediatric age group will prevent these future adults from adding on to the burgeoning population of adult hypertensives at risk for devastating stroke, myocardial infarction, congestive heart failure, arrhythmia, and other cardiovascular events.

Over the years, new clinical knowledge, breakthroughs, and scientific evidence have made it difficult for physicians to thresh out crucial medical information necessary for everyday clinical decisions. Hence, clinical guidelines were formulated to assist practitioners in making more consistent and efficient judgments at the bedside and outpatient clinics. Clinical practice guidelines have increasingly become a standard part of clinical practice. These systematically developed recommendations developed into influencing rules of operation at the clinics, hospitals, and even health directives of insurers and government policymakers to standardize practice and improve clinical outcomes.

In the Philippines, there is no clinical practice guideline drafted for pediatric HTN. The American Academy of Pediatrics (AAP) and the European Society of HTN (ESH) guidelines have served as the references and the sole basis for the standard of care. From the time, the guideline updates were published

Address for correspondence:
Lourdes Paula R. Resontoc, Department of Pediatrics, College of Medicine, University of the Philippines Manila-Philippine General Hospital, Taft Avenue, Manila, Philippines. Tel.: +639178309796. E-mail: lrresontoc@up.edu.ph

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in 2016 (ESH) and 2017 (AAP), scrutiny of its impact to our local population has never been made. In this review, potential benefits and limitations as applied to local practice are explored.

Screening and Diagnosis of Childhood and Adolescent HTN

Accumulation of new medical knowledge stimulated an update of the United States (US) and the European guidelines on pediatric HTN. In 2016, the ESH published its revised version of the guidelines on high blood pressure (BP) in children and adolescents from its first issued guidelines in 2009. Notable in the 2016 guideline is the revised definition of HTN in children 16 years and older. It also highlighted the significance of isolated systolic HTN in children, the importance of out-of-office and central BP measurement, newer risk factors for HTN, methods to assess for vascular phenotypes, clustering of cardiovascular risk factors, and treatment strategies.[2]

On the other hand, AAP released its guidelines for screening, diagnosis, and management of childhood and adolescent HTN in 2017, an update of the prior guidelines of the National Heart, Lung, and Blood Institute Fourth Report on High BP in Children in 2004. Significant changes from the fourth report include revised definitions of BP categories in alignment with the American Heart Association/American College of Cardiology guideline; new normative BP tables based on BPs from normal weight children; simplified screening table and a rigorous evidence-based methodology. It also emphasized the use of 24-h ambulatory BP monitoring (ABPM) in confirming the diagnosis of HTN. Included in the revision are recommendations for the performance of echocardiography and lower treatment goals for primary HTN as well as the ABPM goal for chronic kidney disease (CKD).[3]

Significant differences and similarities are prominent in each of the two guidelines. For instance, in the definition of HTN, the adults based its HTN definition on the cardiovascular morbidity and mortality associated with a certain level of BP, while the pediatric HTN BP definition is arbitrary. HTN is defined based on the normal distribution of BP in healthy children. Because the BP in children is influenced by sex and has been shown to increase with age and body size, interpretation of BP levels is dependent on sex, age, and height. In younger children then, there is no single BP level that can be utilized to define elevated BP. Both guidelines recognize this fact.

Moreover, both guidelines define normal BP in younger children as BP less than the 90th percentile. However, the age cutoff for adolescents differs for both guidelines. The AAP has set the cutoff at 13 years and older and 16 years and older as per ESH guidelines. For both guidelines, elevated BP is now defined by absolute values, for a seamless transition into the adult definition of HTN. The AAP guideline has introduced a new term for BP >90th percentile as "elevated BP" previously referred to as "pre-HTN" in the older guideline, and "high-normal" is the term used by the ESH guideline. Table 1 shows the other similarities and differences between AAP and ESH BP definition.

Correct identification of abnormal BP in children relies on BP tables obtained from normative values of a specific population. The new normative BP tables commissioned for the 2017 AAP clinical practice guidelines were based only on BP readings from ~50,000 multiethnic, normal weight children while the 2016 ESH guidelines have adapted the 2004 US normative data obtained from auscultatory clinic measurement generated from BP values in ~70,000 healthy children which included overweight and obese children.[2-4] Increasing numbers of ethnic-specific reference values, including from China and India, are published.[5,6] Other countries, including the Philippines, with no BP norms, consider the AAP as the international standard. The validity of its application to other ethnic populations is unclear.

A study in India revealed a consistently different pattern in comparison to the existing US reference. Three readings of BP taken by mercury sphygmomanometer and anthropometric data from 20,263 students aged 5–16 years have shown higher diastolic BP for both sexes than international standard across all age groups. For systolic BP values, although the difference appears to be minimal for boys, girls showed higher values than

Table 1: American Academy of Pediatrics and the European Society of Hypertension BP definitions for children and adolescents (1–18 years old)

BP categories and stages	AAP*		ESH**	
	For 1–12 years old (Percentile/mmHg)	≥13 years (Percentile/mmHg)	For 0–15 (Percentile/mmHg)	≥16 yearsW (Percentile/mmHg)
Normal	<90th	<120/<80	<90th	<130/85
Elevated/high-normal	≥90th–<95th or 120/80 mmHg to <95th (whichever is lower)	120–129/<80	≥90th–<95th	130–139/85–89
Hypertension	Not addressed	Not addressed	>95th	≥140/90
Stage 1	≥95th–<95th+12 mmHg or 130/80–139/89 mmHg (whichever is lower)	130–139/80–89	95th–99th+5 mmHg	140–159/90–99
Stage 2	≥95th+12 mmHg or ≥140/90 (whichever is lower)	≥140/90	>99th+5 mmHg	160–179/100–109
Isolated systolic hypertension	Not addressed	Not addressed	SBP≥95th and DBP<90th	≥140/<90

BP: Blood pressure, AAP: American Academy of Pediatrics, ESH: European Society of Hypertension, SBP: Systolic blood pressure, DBP: Diastolic blood pressure

the international standard.[5] Similarly, a comparative study demonstrated higher body mass-adjusted BP levels among South Asian children than White children in the US.[7] Inclusion of overweight and obese children in the norms adopted by the ESH guidelines likely biased normative BP values upward, leading to the underdiagnosis of HTN.

In the Philippines, several issues deemed to be essential in the application of these guidelines to local practice are identified. For instance, it does not include the BP norms of severely stunted children. From a 2011 national survey, excessive stunting, i.e., height below the 5th percentile is noted in 34% of Filipino children younger than 5 years old.[8] Looking at the AAP BP norms, the height cutoff was set at the 5th percentile. It is uncertain if the BP values of children at the 5th percentile are reflective of those below or equal to children with height third percentile. Second, we found a discrepancy in the definition of abnormal BP in both guidelines. To illustrate, a 5-year-old Filipino boy with height at the fifth percentile and a BP of 122/70 mmHg, by AAP definition, falls under the category of Stage 2 HTN and Stage 1 HTN by ESH definition.

Another example would be an adolescent 13-year-old male with a BP of 120/79. Under the AAP, he has elevated BP and a normal BP under the ESH guidelines. Third, many of the 95th percentile BPs for adolescents 16 and 17 years of age were well below the adult cutoff points for HTN. This difference would practically result in a hypertensive adolescent, becoming a normotensive at 18 years of age. These loopholes will then lead to underdiagnosis and missed opportunities for intensive screening, prevention, early diagnosis, and intervention. On the other hand, overdiagnosis will bring about needless and costly workups and unwarranted anxiety among pediatric patients and their caregivers. Due to these discrepancies, there is a need to establish country-specific BP norms that would account for the differences, explain, and cover the cardiovascular risks associated with ethnic predispositions to HTN.

The rigorous screening and follow-up schedules of the AAP guideline and the more extensive initial evaluation for hypertensive children and adolescents of the ESH guidelines are valuable and beneficial for local implementation. Special consideration is the country's unique geography. Most patients come from areas geographically remote from the hospital or clinic. Therefore, every physician encounter must be maximized. Once the diagnosis of HTN is confirmed, extensive workup must ensue to identify the etiology (since secondary HTN is more common in children) and treatment initiated early before sending the patients home. This way, dropouts will be avoided as it would be inconvenient and costly for the patients to return to complete the workup as well as start treatment.

Methods of BP Determination

The BP norms were derived from values obtained using a mercury sphygmomanometer combined with an inflated cuff and auscultation. To date, this method remains the gold standard for the measurement of BP in children. The ban on mercury spurred the use of automated oscillometric and aneroid devices as methods for BP determination. Both guidelines allow for its use provided that the device is appropriately calibrated for pediatric use. However, in cases of abnormal BP, it is recommended to confirm manually, i.e., by auscultation. Locally, the use of automated oscillometric BP machines is rare. Manual (auscultatory) BP determination using aneroid devices has widely replaced the mercury sphygmomanometer. The auscultatory method using an aneroid device is advantageous as it cancels out the confounding effect of the inherent differences in BP readings using these automated devices.[9] The AAP recommends the use of 24-h ABPM for all hypertensive children at diagnosis, children with elevated BP for 1 year and for those with high-risk conditions such as CKD, history of solid organ transplantation, prematurity, obesity, and diabetes; while the ESH recommends its use only at initiation of antihypertensive medication. ABPM is advantageous as it is more reflective of the circadian variability of BP. It can precisely capture white coat and masked HTN. However, it is not practical for local use at this time. Not many centers have the apparatus and the workforce to implement ABPM. Besides, there are no locally available normative values for the correct interpretation of ABPM results. The ESH recommends a more practical tool suitable for local practice, the home BP monitoring. Home BP monitoring is a useful adjunct to the diagnosis and treatment of children with HTN. The recommendation includes specific guidance on how to properly conduct home BP monitoring as well as normative data tailored explicitly to home BP monitoring. This approach allows for more practical application of the guidelines, as completing the required in-clinic BP measurement for HTN diagnosis can be a barrier for some patients and providers.

Management of Childhood and Adolescent HTN

Both guidelines are similar in the non-pharmacologic and pharmacologic approaches in the treatment of HTN. Emphasizing lifestyle modification is noteworthy. The ESH has a more specific weight loss recommendation, level, and duration of an activity. Both recommend the dietary approaches to stop HTN (DASH) diet. The DASH diet has been proven to work.[10] It is, however, challenging to implement the reason being, processed foods are cheaper compared to the prohibitive cost of meals included in the DASH diet.

Optimal BP targets, especially those with obesity, diabetes, CKD, and those who had solid organ transplantation, are reasonable and achievable. Good BP control has been shown to prevent the progression of CKD as well as minimize cardiovascular risks.[11,12]

Conclusion

BP tracking phenomenon in childhood HTN is widely recognized; thus, early recognition, diagnosis, and treatment can prevent future cardiovascular risks. Except for the derivation of BP norms and the discrepant HTN definitions in both the US

and European guidelines, most of the recommendations are essential models for drafting future country-specific pediatric HTN guidelines.

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