



Pediatric Hypertension: Evaluation, Diagnosis and Treatment



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Hypertension in Children and Adolescents

The long-term health risks for children and adolescents with hypertension have become increasingly clear in the last two decades. Evidence now shows that primary hypertension commonly occurs in children. Left ventricular hypertrophy (LVH) is the most prominent clinical evidence of target-organ damage caused by hypertension and has been reported in up to 34% to 38% of children and adolescents with mild, untreated blood pressure (BP) elevation.

Hypertension and prehypertension have become a significant health issue in the pediatric population due to a strong association of high BP with obesity and the marked increase in the prevalence of overweight children.

Primary hypertension often clusters with other risk factors. In a child with primary hypertension, the presence of any comorbidity associated with hypertension can increase the risk for cardiovascular disease (CVD) and have adverse effects on health outcomes. Secondary hypertension is more common in children than adults, so the possibility of an underlying disorder should be considered in every pediatric patient with hypertension.

Measuring Blood Pressure

The preferred method of BP measurement is auscultation using a cuff appropriately sized for the upper extremity, ideally the right arm. Children >3 years old should have their BP measured at least once during every health care episode. Children <3 years old should have their BP measured with the presence of one or more of these circumstances:

- History of prematurity, very low birth weight, or other complication requiring intensive care
- Congenital heart disease
- Recurrent urinary tract infections, hematuria, or proteinuria
- Known renal disease or urologic malformations
- Family history of congenital renal disease
- Solid-organ transplant
- Malignancy or bone marrow transplant
- Treatment with drugs known to raise BP
- Other systemic illnesses associated with hypertension (neurofibromatosis, tuberous sclerosis, etc.)
- Evidence of elevated intracranial pressure

Definition of Hypertension

Hypertension is defined as an average systolic BP (SBP) and/or diastolic BP (DBP) that is ≥ 95 th percentile for gender, age and height on ≥ 3 occasions.

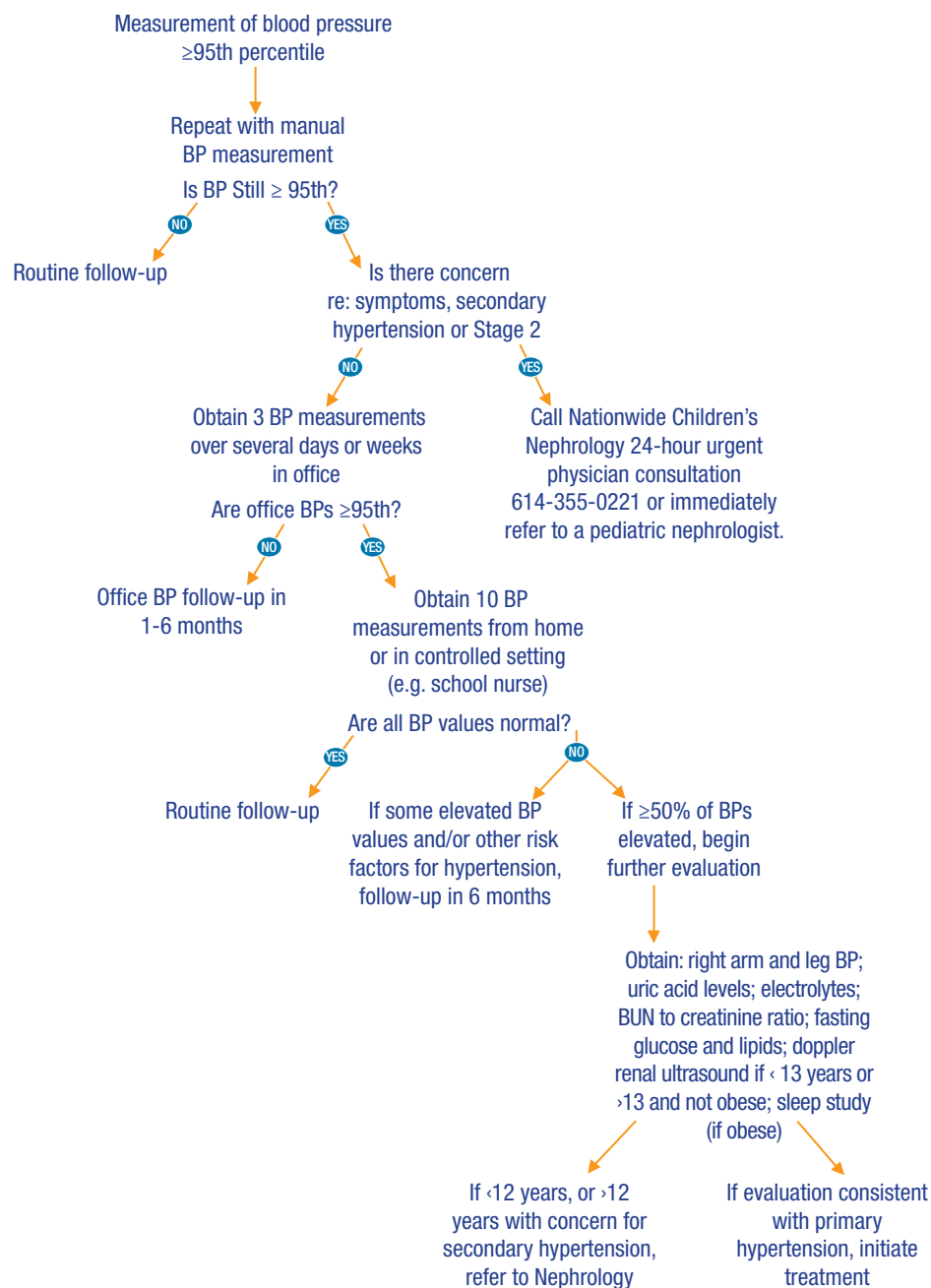
- Prehypertension: Average SBP and/or DBP levels that are ≥ 90 th but < 95 th percentile.
- Stage 1 hypertension: Average SBP and/or DBP levels that are 95th-99th percentile plus 5mm Hg.
- Stage 2 hypertension: Average SBP and/or DBP levels that are > 99 th percentile plus 5mm Hg.

As with adults, adolescents with BP levels $\geq 120/80$ mm Hg should be considered prehypertensive. A patient with BP levels >95 th percentile in a physician's office or clinic, who is normotensive outside a clinical setting, may have "white-coat hypertension." Ambulatory BP monitoring is usually required to make this diagnosis.

Tables laying out exact percentiles and measurements are widely available online. The definitive tables are presented in The Fourth Report on the Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents from the National Heart, Lung, and Blood Institute of the National Institutes of Health. A link to the tables is also presented in the "Resources" section of the International Pediatric Hypertension Association website, www.iphapediatrichypertension.org.

Diagnosing Hypertension

Nationwide Children's Hospital has created this algorithm to guide the evaluation and management of pediatric hypertension.



Treatment of Hypertension

Treatment of pediatric hypertension should always include lifestyle modifications and education. Pharmacologic therapy, when indicated, should be initiated with a single drug. Acceptable drug classes for use in children include ACE inhibitors, angiotensin-receptor blockers, B-blockers, calcium channel blockers (CCB), and diuretics. We recommend CCB or ACE inhibitors first because they are well tolerated and can be taken once per day.

Therapeutic Lifestyle Changes

- Weight reduction/dietary changes - The DASH (Dietary Approaches to Stop Hypertension) Diet can be a helpful guide.
- Exercise
- Stress reduction/coping mechanisms
- Smoking/substance abuse interventions
- Family-based multidisciplinary interventions

Indications for Pharmacologic Management

- Symptomatic hypertension
- Secondary hypertension
- Stage 2 hypertension
- Evidence of hypertensive end-organ damage
- Diabetes (type 1 or type 2) or chronic kidney disease (CKD)
- Persistent hypertension despite non pharmacologic measures

The goal for antihypertensive treatment in children should be reduction of BP to <95th percentile unless concurrent conditions are present, in which case BP should be lowered to <90th percentile. Blood pressure should be monitored at least weekly (at home or school) and medication dose titrated until goal BP is achieved. Once at goal, BP should be monitored at least monthly and patients should be seen in the office every six months.

Example of an initial medication course:

- Amlodipine (CCB). One dose per day; 0.1 mg per kilogram of child's weight. Maximum starting dose 5 mg; overall max dose 10 mg.

Or

- Lisinopril (ACE inhibitor). One dose per day; 0.1 mg per kilogram of child's weight. Maximum starting dose of 10 mg; overall max dose of 20 mg.

If the goal cannot be reached at maximum dosage, or if there are concerning side effects, a referral to Nephrology should be made.

Referrals and Consultations

Online: NationwideChildrens.org/nephrology

Phone: (614) 722-4360 | Fax: (614) 722-6482

Physician Direct Connect Line for 24-hour urgent physician consultations: (614) 355-0221 or (877) 355-0221.