

Hypertension in Children

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Description/Etiology

In adults, hypertension (HTN) is defined as a sustained elevation in blood pressure (BP) above a fixed number (e.g., 140/90 mm Hg); in children (including adolescents), frequency-distribution curves of normative data for BP which vary by age, height, and gender are used to define the normal range of BP and to diagnose HTN based on percentile curves. As children grow, the acceptable standard for normal BP level increases until it approaches adult levels. BP in children is considered normal when the measurement is less than the 90th percentile for age, height, and gender. According to standardized tables, HTN in children is defined as an average systolic or diastolic BP that is in the 95th percentile or higher for the child's gender, age, and height when measured on three separate occasions. For example, the 95th percentile/definition of HTN in a girl of average (i.e., in the 50th percentile) height at age 1 is about 104/58, at age 6 is about 111/74, and at age 12 is about 123/80; children below the 95th percentile but exceeding the 90th percentile are considered prehypertensive. In adolescents, a BP of 120/80 mm Hg or greater is considered prehypertensive even if it is lower than the 90th percentile for the adolescent's age, height, and gender. Best practice standards require annual BP measurement in every child older than 3 years. As a whole, many pediatric clinicians may still not measure or fully recognize elevated BP in children; as a result, HTN in children remains underdiagnosed.

HTN can be primary (i.e., idiopathic; also called essential) or secondary as the result of an identified underlying disease or condition (e.g., Wilms' tumor, neuroblastoma, coarctation of the aorta, renal parenchymal disease). Primary HTN accounts for 95% of HTN cases in adults. Typically, younger age and higher BP in children increase the likelihood that HTN is secondary to an underlying disease. Primary HTN is more likely after puberty. Although secondary HTN has historically been more common in children, primary HTN is becoming more prevalent as rates of obesity rise. (For more information on HTN, see *Quick Lesson About...Hypertension: an Overview.*)

Children with pre-HTN should receive education about a healthy lifestyle and frequent medical surveillance to monitor BP levels. Referral to a clinician who specializes in pediatric HTN is recommended for treatment of all children with HTN; children with secondary HTN may require a multispecialty team of clinicians in fields that include endocrinology and surgery, depending on underlying disease. Treatment of HTN in children involves lifestyle modifications (e.g., dietary restriction, exercise, and weight loss), with the goal of normalizing BP and avoiding the need for antihypertensive medications. Close monitoring for target organ damage (e.g., brain, eyes, kidneys, heart, and blood vessels) is essential. Antihypertensive medications are given to children with severe HTN and target organ damage, and to children whose BP is not controlled by lifestyle modification alone. Pediatric dosing is available in angiotensin-converting enzyme (ACE) inhibitors; beta blockers; thiazide, loop, and potassium-sparing diuretics; calcium channel blockers; angiotensin-receptor blockers (ARBs); and certain other antihypertensive agents. Treatment goals are < 95th percentile, or < 90th percentile in patients with chronic kidney disease, diabetes mellitus, or target organ damage. Patient and family member education and emotional support are essential to promote treatment regimen adherence and a favorable prognosis.

Facts and Figures

Twenty to 30 years ago the prevalence of HTN in children was 0.3–1.2%; it is now 3.2–4.5%. Renal parenchymal disease is the cause of 60–70% of cases of HTN in children, while primary HTN accounts for 85–95% of cases in adolescents. In children, obesity is associated with a 3-fold increase in risk for developing HTN and ~ 60% of children with HTN weigh > 120% the median weight for gender, height, and age. Gender causes minimal variation in BP norms for children prior to age 6 years; from age 6 to puberty average BP is slightly higher in girls and at puberty and beyond average BP is higher in boys. Pre-HTN progresses to HTN at a rate of 7% per year. A 42% reduction in salt intake in children and adolescents results in a clinically significant BP reduction of 1.17/1.29 mm Hg.

Risk Factors

There are many risk factors for development of HTN in children, including family history, obesity, sedentary lifestyle, diabetes mellitus, metabolic syndrome, smoking, alcohol use (even in small amounts), excess dietary sodium, and underlying heart or renal disease.

Signs and Symptoms/Clinical Presentation

HTN in children is usually asymptomatic. Severe HTN presentation may include headache, fatigue, blurred vision,

epistaxis (i.e., nosebleed), Bell's palsy, abdominal pain, or chest pain, and children may exhibit subtle signs and symptoms of irritability, decline in school performance, or personality changes.

Assessment

▶ Patient History

- Assess for normal levels of growth and development and assess risk factors

▶ Laboratory Tests That May Be Ordered

- CBC, electrolytes, lipid profile, BUN, creatinine, glucose, and other tests may indicate abnormalities
- UA may reveal proteinuria and elevated levels of BUN and creatinine, indicating kidney dysfunction
- Glomerular filtration rate (GFR) may be abnormal, indicating renal dysfunction

▶ Other Diagnostic Tests/Studies

- MRI of the brain may show abnormal brain changes
- Eye exam may identify retinopathy
- Echocardiography may show left ventricular hypertrophy in a hypertensive child
- Renal imaging may show renal dysfunction in children with HTN related to underlying renal disease

Treatment Goals

▶ Resuscitate During Hypertensive Crisis and Maintain Optimum Physiologic Status

- Monitor vital signs (especially frequent BP checks), assess all physiologic systems (especially for crisis-related underlying disease), and review laboratory results; immediately report abnormalities and treat, as ordered
- Closely monitor for cerebral edema, seizures, heart failure, pulmonary edema, and renal failure; follow facility protocols for seizure precautions and treat presenting complications, as ordered (commonly used drugs in hypertensive emergencies include nicardipine, labetalol, and sodium nitroprusside)
 - Seizures should be treated with fast-acting antihypertensives; anticonvulsant drugs are usually ineffective for seizures related to hypertensive crisis
- Administer antihypertensive agents, as ordered
- Monitor treatment efficacy and for adverse effects; intensively monitor to prevent underperfusion of vital organs resulting from an excessively rapid BP decrease
- Follow facility pre- and postsurgical protocols if patient becomes a surgical candidate (e.g., for surgical intervention in severe renal vascular HTN, renal segmental hypoplasia, coarctation of the aorta, Wilms' tumor, or pheochromocytoma); reinforce pre- and postsurgical education to patient/family members and verify completion of facility informed consent documents
- Encourage family member visitation and rooming-in, as appropriate

▶ Provide Emotional Support and Educate About Treatment Adherence

- Assess patient/family member anxiety level and coping ability; provide emotional support, educate, and encourage discussion about HTN etiology, the target BP level, treatment risks and benefits, and individualized prognosis. Request referral, if appropriate, to a dietitian for education on nutrition and dietary restriction (e.g., decreased sodium and avoiding processed foods) and to a mental health clinician for patient/family counseling on coping strategies

Food for Thought

- ▶ Prematurity and low birth weight (LBW) are risk factors for HTN early in life; potential mechanisms underlying this association include higher risk of obesity, a reduction in nephron numbers, increased activity of the sympathetic nervous system, and impaired endothelial function

Red Flags

- ▶ BP elevation in children increases risk for adult-onset cardiovascular complications, although the frequency of complication development is unknown
- ▶ Appropriate cuff size is crucial for accurate BP measurement in children. The width of the rubber bladder in the cuff should cover about 40% of the child's arm circumference at a point midway between the olecranon and the acromion; the length of the bladder in the cuff should cover about 90% of the arm circumference

What Do I Need to Tell the Patient/Patient's Family?

- ▶ Emphasize the importance of continued medical surveillance and strict adherence to the individualized treatment regimen of lifestyle modification (e.g., regular physical activity and weight loss) and antihypertensive agents, as appropriate

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