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Guidelines

Hypertension Canada's 2020 Comprehensive Guidelines for the Prevention, Diagnosis, Risk Assessment, and Treatment of Hypertension in Adults and Children

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RÉSUMÉ

Les lignes directrices 2020 d'Hypertension Canada pour la prévention, le diagnostic, l'évaluation des risques et le traitement de l'hypertension chez l'adulte et l'enfant fournissent aux professionnels de la santé et aux patients des conseils complets et fondés sur des données probantes. Hypertension Canada élabore ces lignes directrices en utilisant une méthodologie rigoureuse, en atténuant soigneusement le risque de partialité dans notre processus. Tous les projets de recommandations sont soumis à une évaluation critique par des experts en méthodologie, sans partialité, afin d'en garantir la qualité. Notre panel de lignes directrices est diversifié, comprenant de multiples groupes de professionnels de la santé (soins infirmiers, pharmacie, universitaire et médecins), et a travaillé de concert avec des experts en soins primaires et d'experts en mise en œuvre pour garantir une utilisation optimale. Les lignes directrices 2020 comprennent de nouvelles orientations sur la gestion de l'hypertension résistante et la prise en charge de l'hypertension chez les femmes qui planifient une grossesse.

Special Populations

2. Hypertension and Pediatrics

Key Messages

- BP should be measured regularly in children 3 years of age or older; the auscultatory method is the gold-standard at present.
- Simplified diagnostic thresholds can be used (in addition to or as an alternative to normative tables) to diagnose hypertension in children and adolescents.
- If office BP readings are elevated, ABPM is recommended using devices independently validated in children and interpreted with appropriate pediatric normative data.
- In children with confirmed hypertension, routine echocardiographic evaluation should be performed, and cardiovascular risk factors should be assessed with routine laboratory tests.
- Health behaviour management should aim for a healthy body weight through a comprehensive approach that includes dietary education and increased physical activity.
- Secondary hypertension should be ruled out before pharmacological therapy is introduced in children with symptomatic hypertension, target organ damage, comorbidities, persistent, or stage 2 hypertension.
- Initial therapy should be monotherapy, with an ACE inhibitor or ARB (not first-line in black children), or a long-acting dihydropyridine CCB.
- The treatment goal is systolic and diastolic office BP and/or ABPM $<$ 95th percentile or $<$ 90th percentile in children with risk factors or target organ damage.
- Complex cases should be referred to an expert in pediatric hypertension.

I. Accurate measurement of BP in children

Recommendations

1. BP should be measured regularly in children 3 years of age and older by a health care professional using standardized pediatric techniques (Table 15) (Grade D).
2. BP may be measured with a mercury sphygmomanometer, aneroid sphygmomanometer, or oscillometric device (Grade D). Abnormal oscillometric values should be confirmed with auscultation (Grade C).
3. BP varies with age, sex, and height in children and, therefore, BP values should be compared with norms for age, sex, and height (Table 16; Grade D).

II. Criteria for diagnosis of hypertension in children

New recommendations for 2020

- Simplified diagnostic thresholds can also (in addition to or as an alternative to normative tables) be used to diagnose hypertension in children and adolescents.

New criteria for diagnosis of hypertension in children have been introduced in an effort to simplify diagnosis, whereby BP thresholds can be considered. These changes were on the basis of evidence from a longitudinal cohort of 1225 participants from the Bogalusa Heart Study with 27 years of follow-up and repeated BP measurements from childhood to adulthood comparing the traditional definitions vs a simplified approach.[92] The latter used the following BP thresholds: 120/80 for children ages 6-11 years and 130/85 for children ages 12-17 years. Both definitions were equally predictive of adulthood hypertension and subclinical cardiovascular outcomes. When BP is greater than the 95th percentile, a simplified approach is also recommended for staging of hypertension using the 95th percentile alone; this is intended to eliminate the need for using BP tables with the 99th percentile.

- Consider assessing non-HDL cholesterol when evaluating cardiovascular risk in children and adolescents with hypertension.

Non-HDL cholesterol could be considered when analyzing the lipid profile of children with hypertension.

Higher non-HDL cholesterol, above the ideal threshold of 3.1 mmol/L, has been associated with higher body mass index and higher DBP.[93] Furthermore, high non-HDL cholesterol has been associated with two- to threefold increased odds of coronary artery atherosclerotic lesions identified in autopsies on 15- to 34-year-old accident victims.[94]

Recommendations

1. Using OBPMs, children can be diagnosed as hypertensive if SBP or DBP is at the 95th percentile or greater for age, sex, and height, measured on at least 3 separate occasions (Grade C), or if SBP or DBP is $>$ 120/80 mm Hg in children 6-11 years of age, or greater than 130/85 mm Hg in children 12-17 years of age (Grade C; **revised recommendation**).
2. If the SBP and/or DBP is at the 95th percentile or greater, BP should be staged. Stage 1 is defined by BP between the 95th percentile and 95th percentile plus 12 mm Hg. Stage 2 is defined by BP $>$ 95th

Table 14. Pheochromocytoma

Screening and diagnosis	
I	To screen for pheochromocytoma:
A	Twenty-four-hour urinary total metanephrines and catecholamines (sensitivity 90%-95%) or 24-hour urine fractionated metanephrines (sensitivity of approximately 95%) should be measured. Concomitant measurement of 24-hour urine creatinine should also be performed to confirm accurate collection
B	Plasma free metanephrines and free normetanephrines, where available, might also be considered (sensitivity up to 99%)
C	Urinary vanillylmandelic acid measurements should not be used for screening
II	Keep in mind that potential false positive results should be considered in the setting of:
A	Interfering drugs
B	Incorrect patient preparation and positioning (for plasma metanephrine measures)
C	Mild elevation of screening values (ie, less than twofold the upper limit of normal)
D	Normal values on repeat testing
E	Only 1 abnormal biochemical test in the panel of assays
F	Atypical imaging results for pheochromocytoma
G	A low pretest probability of pheochromocytoma
H	Acute illness/hospitalization
III	In the presence of borderline biochemical test results or potentially false positive results, repeat testing may be performed and/or the clonidine suppression test may be used. This should be done before imaging is requested to avoid identifying potential incidentalomas
IV	Imaging (eg, computed tomography, magnetic resonance, with or without iodine I-131 meta-iodobenzylguanidine scintigraphy) should generally be performed only after biochemical confirmation of disease
Treatment	
I	Definitive treatment is surgical resection. Preoperative planning is recommended for blood pressure control and volume expansion
A	α-Blockade should be started 10-14 days preoperatively. Typical options include phenoxybenzamine (a long-acting, nonselective irreversible α-blocker), prazosin, or doxazosin
B	Other antihypertensive medications may be added as necessary but diuretics should be avoided if possible. Oral β-blockers may be considered after achieving adequate α-blockade to control tachycardia and prevent arrhythmias during surgery
C	Volume replacement and liberal sodium intake should be encouraged because volume contraction is common in this condition. Intravenous volume expansion in the perioperative period is recommended to prevent postoperative shock
II	Postoperatively, long-term follow-up is recommended with urinary or plasma metanephrine levels to screen for recurrence, especially in those with a genetic predisposition
III	Genetic testing should be considered for individuals younger than 50 years of age and for all patients with multiple lesions, malignant lesions, bilateral pheochromocytomas, or paragangliomas, or a family history of pheochromocytoma or paraganglioma

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percentile plus 12 mm Hg (Grade D; **revised recommendation**).

i. If BP is stage 1, BP measurements should be repeated on 2 more occasions within 1 month; if hypertension is confirmed, evaluation (as described in section *IV. Routine laboratory tests for the investigation of children with hypertension*)[95] and/or appropriate referral should be initiated within 1 month, or both (Grade D).

ii. If BP is stage 2, prompt referral should be made for evaluation and therapy (Grade C).

3. All children with suspected or confirmed hypertension should undergo a hypertension-focused history and physical evaluation (Table 17; Grade C).

III. Assessment of overall cardiovascular risk in hypertensive children

Recommendations

1. Cardiovascular risk factors should be assessed in hypertensive children (Grade C).

IV. Routine laboratory tests for the investigation of children with hypertension

Recommendations

1. Routine tests that should be performed for the investigation of all children with hypertension include:
   i. Blood chemistry (sodium, potassium, chloride, total CO_2, and creatinine; Grade D);

Table 15. Standard approach for BP measurement in children (Grade D)

1. Children who will undergo BP measurement should avoid stimulant medications before evaluation. At the time of evaluation, the child should be seated in a quiet room for 5 minutes with back supported before the measurement of blood pressure
2. The right arm is the preferred location for BP measurement for comparison with normative data because of the possibility of coarctation of the aorta, which might result in an erroneously low BP measurement being obtained in the left arm
3. A cuff size with a bladder width that is at least 40% of the arm circumference and the cuff bladder length should cover 80%-100% of the circumference of the arm. The arm should be bare and supported with the BP cuff at heart level. To obtain accurate measurements in children a range of pediatric and adult cuff sizes should be available
4. The pressure should be increased rapidly to 30 mm Hg above the level at which the radial pulse is extinguished
5. The stethoscope should be placed below the bottom edge of the cuff and above the antecubital fossa. The bell or diaphragm of the stethoscope should be held gently and steadily over the brachial artery
6. The control valve should be opened so that the rate of deflation of the cuff is approximately 2 mm Hg per heartbeat
7. The systolic level—the first appearance of a clear tapping sound (phase I Korotkoff)—and the diastolic level (the point at which the sounds disappear; phase V Korotkoff) should be recorded. In some children, Korotkoff sounds can be heard to 0 mm Hg. If Korotkoff sounds persist as the level approaches 0 mm Hg, then the point of muffling of the sound is used (phase IV Korotkoff) to indicate the diastolic pressure
8. The BP should be recorded to the closest 2 mm Hg on the manometer (or 1 mm Hg on electronic devices)

BP, blood pressure.

Table 16. Determining normative data for BP values in children (Grade D)

1. The BP tables use growth parameters as defined in the CDC growth charts
2. The normative BP data obtained with the auscultatory method includes the US National Health and Nutrition Examination Survey, 1999-2000. Normative BP data for oscillometric measurements are now available
3. To determine BP percentile, use the standard CDC height charts to determine the height percentile
4. Measure the child's blood pressure. Use the appropriate gender table. Locate the child's age on the left side of the table and follow the age row horizontally across the table to the intersection of the line for the height percentile as shown in the vertical column
5. The 50th, 90th, 95th, and 99th percentiles are defined for systolic and diastolic blood pressure on the basis of gender, age, and height

BP, blood pressure; CDC, Centers for Disease Control and Prevention.

ii. Urinalysis (Grade D);
iii. Renal ultrasound (Grade D);

2. Routine laboratory tests that should be performed for the assessment of cardiovascular risk in all children with hypertension include the following:
   i. For diabetes screening refer to Diabetes Canada clinical practice guidelines (https://www.diabetes.ca/health-care-providers/clinical-practice-guidelines/chapter-35#panel-tab_FullText) (chapters on children and adolescence) (**revised recommendation**);
   ii. Serum total cholesterol and HDL cholesterol, low-density lipoprotein cholesterol, non-HDL cholesterol, and triglycerides (Grade C; **revised recommendation**).
3. Routine tests that should be performed for the assessment of target organ damage in all children with hypertension include:
   i. Echocardiogram (Grade C);
   ii. Retinal examination (Grade C);
   iii. Albumin/creatinine ratio (first morning; Grade D).

V. Ambulatory BP measurement in children

Recommendations

1. For children with elevated office BP readings, ABPM should be guided by a physician with expertise in pediatric hypertension; ABPM is useful to classify BP (Supplemental Table S7; Grade C).
2. Physicians should use only ABPM devices that have been validated independently in children using established protocols. A standard approach to obtaining ABPM readings should be used (Supplemental Table S7; Grade D).

Table 17. History and physical examination of children (Grade C)

1. Medical history
Symptoms
- Of hypertension
- Of an underlying disorder*

Past medical history
- For underlying cause of hypertension* (including neonatal history)
  Identify other cardiovascular risk factors including inactivity, smoking, and dietary factors
  Family history

2. Patient physical examination
  Height, weight, and body mass index
  Vital signs including upper and lower limb blood pressures
  Evaluation for signs of end organ damage
- Fundi, cardiovascular, and neurologic systems
  Evaluation for underlying cause of hypertension*

*Systems to review include renal, cardiovascular, endocrine, and neurologic, as well as medications/drugs and sleep disorders.

3. ABPM levels should be interpreted with appropriate pediatric normative data for children 5 years of age or older or height of $\geq$ 120 cm (Grade D).

VI. Role of echocardiography

Recommendations

1. Routine echocardiographic evaluation in children with confirmed hypertension is recommended (Grade D).
2. The echocardiographic assessment should include measurements of left ventricular mass index, systolic and diastolic left ventricular function, and evaluation of the aortic arch (Grade D).

VII. Health behaviour management

Recommendations

1. Height and weight should be measured and body mass index calculated for all children at routine health visits (Grade D).
2. Achieving a healthy body weight (body mass index percentile $<$ 85%) is recommended for nonhypertensive individuals to prevent hypertension and for hypertensive children to reduce BP (Grade C).
3. A comprehensive approach should include dietary education and increased physical activity (Grade C).

VIII. Indications for drug therapy for children with hypertension

Recommendations

1. Pharmacological therapy should be initiated when patients have:
   i. Symptomatic hypertension (Grade D);
   ii. Hypertensive target organ damage (Grade C);
   iii. Stage 2 hypertension (Grade D);
   iv. BP $\geq$ 90th percentile associated with diabetes mellitus type 1 or 2, chronic kidney disease, or heart failure (Grade D);
   v. Stage 1 hypertension without target organ damage that persists ($\geq$ 6 months) despite a trial of non-pharmacologic therapy (Grade D).
2. In children with proven secondary hypertension, specific treatment of the underlying disease must be initiated by an expert in pediatric hypertension (Grade D).

IX. Choice of drug therapy for children with hypertension

A. Recommendations for children with systolic and/or diastolic hypertension

Recommendations

1. Initial therapy should be monotherapy.
   i. Recommended monotherapy choices are:
      a. An ACE inhibitor (Grade C);
      b. An ARB (Grade C); or
      c. A long-acting dihydropyridine CCB (Grade D).
   ii. An alternate option is a β-blocker (Grade D) although they are less preferable because of the side effect profile in children.
   iii. If there are adverse effects, another drug from this group should be substituted.
2. If BP goals are not achieved with standard-dose monotherapy for $\geq$ 6 months, children should be referred to an expert in pediatric hypertension (Grade D).
3. ACE inhibitors (Grade C) and ARBs (Grade D) are not recommended as first-line agents in black patients and β-blockers are not recommended as first-line agents in children with asthma or diabetes (type 1 or type 2), and high-performance athletes (Grade D).

X. Goals of therapy for children with hypertension

Recommendations

1. The treatment goal is office BP (systolic and diastolic) $<$ 95th percentile (Grade D). The goal for ABPM is BP (systolic and diastolic) $<$ 95th percentile (Grade D).
2. For patients with risk factors or target organ damage the goal is BP (systolic and diastolic) $<$ 90th percentile (Grade D).