

# Diagnosis of hypertension and lifestyle modifications for its management

Patients should be encouraged to take advantage of the many resources that support patients who need to limit sodium intake, engage in more physical activity, and make other changes to prevent and control high blood pressure.

**ABSTRACT:** Hypertension can be diagnosed from blood pressure measurement in the office or home, or from ambulatory 24-hour blood pressure measurement, provided that recommended equipment and measurement techniques are used in all cases. A history, physical examination, and routine laboratory tests are needed to exclude less common secondary causes of hypertension and to determine whether target organ damage has occurred. Following diagnosis, lifestyle modifications involving healthy eating, sodium reduction, and increased physical activity can be helpful in managing and preventing hypertension. A comprehensive, structured, multidisciplinary approach that simultaneously addresses all key factors within the context of a holistic health perspective has been found to sustain effective change. Many affordable tools, techniques, and resources that encourage patient self-management are available provincewide to support such an approach.

**M**annual office blood pressure (BP) measurement can be used to diagnose hypertension when readings from three separate visits are averaged and the systolic blood pressure (SBP) is equal to or greater than 160 mm Hg, or the diastolic blood pressure (DBP) is equal to or greater than 100 mm Hg. Hypertension can also be diagnosed when readings from five visits are averaged and the SBP is equal to or greater than 140 mm Hg, or the DBP is equal to or greater than 90 mm Hg.<sup>1</sup> While elevated BP from more than one reading is required for a diagnosis of hypertension, a single reading can be enough to identify hypertensive urgency or a hypertensive emergency, conditions that require immediate management. The features of a hypertensive crisis include asymptomatic DBP elevation equal to or greater than 130 mm Hg or hypertensive encephalopathy (associated headache, irritability, alteration in consciousness, and other manifestations of CNS dysfunction) or the presence of marked blood pressure elevation in association with conditions such as acute aortic dissection, acute left ventricular failure, or acute myocardial ischemia.<sup>1</sup>

Hypertension may also be diagnosed with additional blood pressure measurement in out-of-office settings. Ambulatory BP measurement (ABPM) should be considered when an office-induced increase in BP is suspected or BP readings in the office fluctuate. Hypertension can be diagnosed using an ABPM, when the average awake SBP is equal to or greater than 135 mm Hg, or the average DBP is equal to or greater than 85 mm Hg. Hypertension is also diagnosed when the average 24-hour SBP is equal to or

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greater than 130 mm Hg, or the average DBP is equal to or greater than 80 mm Hg.<sup>1</sup>

Home BP measurement can be used to diagnose hypertension as well, as long as the clinician ensures that the patient is using an approved device (<http://hypertension.ca/chep/approved-home-bp-device>), the patient follows proper procedures, and, preferably, the device can print out the reading. If all these conditions are met, home measurement of BP can be used to diagnose hypertension when the average SBP is equal to or greater than 135 mm Hg, or the average DBP is equal to or greater than 85 mm Hg.<sup>1</sup>

### Initial assessment

When assessing patients for hypertension, a history should be taken and a physical examination performed to identify any associated conditions (diabetes mellitus, dyslipidemia, chronic kidney disease) and target organ damage from hypertension (stroke, chronic kidney disease, retinopathy, cardiac disease). Importantly, the history and physical examination can help establish whether the patient has secondary causes of hypertension, such as coarctation of the aorta or Cushing syndrome. Exogenous factors that can induce or aggravate hypertension should be identified and managed if possible (see “Assessing and managing resistant hypertension” in this issue).

Routine laboratory tests should be performed for the investigation of all patients with hypertension:

- Urinalysis.
- Blood chemistry (potassium, sodium, and creatinine).
- Standard 12-lead electrocardiography to assess for left ventricular hypertrophy or concomitant evidence of previous myocardial infarction.<sup>1</sup>

Tests for risk stratification should also be performed—a fasting blood glucose test and a fasting lipids test

(total cholesterol, high-density lipoprotein cholesterol, low-density lipoprotein cholesterol, and triglycerides)—to determine the patient’s global cardiovascular risk.<sup>1</sup>

Investigations for secondary causes of hypertension should be initiated for patients with clinical features or laboratory findings suggestive of severe hypertension or hypertension resistant to multiple medications.<sup>1</sup> Additional investigation is indicated for patients with increased probability of secondary hypertension. Labile hypertension accompanied by headache, palpitations, and diaphoresis suggests the possibility of pheochromocytoma. The detection of abdominal bruit, especially lateralized to the renal area, suggests renovascular disease. Truncal obesity with purple striae suggests Cushing syndrome. Abnormalities on routine clinical tests, such as hypokalemia, suggest the possibility of primary aldosteronism; hypercalcemia suggests possible hyperparathyroidism; and elevated creatinine or abnormal urinalysis can indicate renal disease. While the majority of patients do not have a specific cause for hypertension, it is important to consider the possibility of a secondary cause.

### Hypertension in older patients

Hypertension in older patients merits special consideration because of the high prevalence of hypertension in older age groups, and the increasing proportion of older persons in Canada.

Concepts are changing about the pathophysiology of hypertension in older age groups, with growing acceptance of the dominant role of aging-induced changes in arterial structure and the function of large vessels.<sup>2,3</sup> The fracture of the individual elastin lamellae with aging is known to play a role in the stiffening and

dilatation of large arteries.<sup>3</sup> The consequence of stiffer arteries is that reflection waves return earlier to the heart and lead to an augmentation of aortic systolic pressure. This explains the increased prevalence of isolated systolic hypertension in older individuals. The augmentation of SBP increases myocardial oxygen demand and increases the loading condition on the heart, which in turn accentuates myocardial ischemia and the development of cardiac hypertrophy.<sup>2</sup> Arterial stiffness-induced increased SBP with a decrease in DBP results in an increase in pulse pressure that can produce more damage in organs such as the brain and kidney, where the vasculature cannot dampen the increased pulse pressure to the same extent possible in some other organs.<sup>3</sup> The ensuing microvascular damage contributes to chronic kidney disease and vascular cognitive impairment.<sup>4,5</sup>

Evidence that antihypertensive drug therapy in older individuals with hypertension can reduce cardiovascular morbidity and mortality suggests that the changes in arterial structure with aging are not immutable but can be modified, and that blood pressure reduction is of value across the age spectrum. In randomized controlled trials in patients over 60 years of age, a diuretic or dihydropyridine calcium channel blocker or an ACE inhibitor, but not beta-blockers, significantly reduced cardiovascular events and mortality.<sup>6,7</sup> In patients who were 80 years of age or older and had a sustained systolic blood pressure of 160 mm Hg or more, active treatment with a diuretic followed by an ACE inhibitor when necessary was associated with a significant fall in all-cause mortality (21%), death from cardiovascular causes (23%), rate of fatal or non-fatal stroke (30%), and a reduction in the rate of heart failure (64%).<sup>8</sup>

### Lifestyle modifications

Authors of major position statements and systematic literature reviews have concluded that healthy eating, active living, and achieving a healthy weight have a major impact on prevention and management of hypertension.<sup>1,9-14</sup> More specifically, the risk factors of overweight, physical inactivity, and high sodium intake appear to be major independent contributors to hypertension.<sup>10,11,14</sup> Indeed, clustering these risk factors into low-risk or high-risk groupings allows us to identify individuals at high or low risk of developing hypertension.<sup>11</sup> **Table 1** shows the evidence-based recommendations for lifestyle modifications that have the greatest impact on preventing and managing hypertension.

The Canadian Hypertension Education Program (CHEP) recommends that “Hypertensive patients and normotensive individuals at increased risk of developing hypertension consume a diet that emphasizes fruits, vegetables and low-fat dairy products, dietary and soluble fibre, whole grains and protein from plant sources and that is reduced in saturated fat and cholesterol.”<sup>15</sup>

The DASH (Dietary Approaches to Stop Hypertension) diet,<sup>16,17</sup> which was developed specifically to address hypertension and traditionally referenced as the recommended dietary guideline along with other DASH-like diets, is very similar (although not identical) to the current recommendations found in “Eating Well with Canada’s Food Guide”<sup>18</sup> and CHEP.<sup>15</sup> The DASH diet is known to result in substantial reductions in blood pressure, even when sodium intake is not reduced.<sup>19</sup>

### Best practices and patient resources

Supporting patients who are making lifestyle changes aimed at preventing

**Table 1. Key lifestyle changes to prevent and manage hypertension.**

Modification	Recommendation	Impact on hypertension*
Healthy eating	<ul style="list-style-type: none"> <li>Follow “Eating Well with Canada’s Food Guide.”</li> </ul>	8–14 mm Hg
Sodium reduction	Depending on age, limit sodium intake: <ul style="list-style-type: none"> <li>1500 mg per day maximum for those 50 years and younger.</li> <li>1300 mg per day maximum for those 51–70 years.</li> <li>1200 mg per day maximum for those 71 and older.</li> </ul>	2–8 mm Hg
Physical activity	Engage in regular physical activity: <ul style="list-style-type: none"> <li>Children aged 5–11 years and youth aged 12–17 years should accumulate at least 60 minutes of moderate- to vigorous-intensity physical activity daily.</li> <li>Adults of any age should accumulate at least 150 minutes of moderate- to vigorous-intensity aerobic physical activity per week, in bouts of 10 minutes or more.</li> </ul>	4–9 mm Hg
Healthy weight	<ul style="list-style-type: none"> <li>Maintain or achieve healthy body weight (BMI 18.5–24.9).</li> <li>To achieve a healthier BMI, set a weight-loss goal of 5% to 10% body weight with no more than a 0.5 kg (0.5–1.0 lb) weight loss per week.</li> </ul>	5–20 mm Hg per 10–14 kg weight loss
Moderate alcohol consumption	Limit alcohol intake: <ul style="list-style-type: none"> <li>Less than two standard drinks per day for men.</li> <li>Less than one standard drink per day for women.</li> </ul>	2–4 mm Hg
Stress management	<ul style="list-style-type: none"> <li>Learn to deal with everyday life challenges and obtain help for mental health problems.</li> </ul>	Variable

\*Approximate range of BP reduction from JNC 7<sup>10</sup>

or managing hypertension calls for a comprehensive, structured, multi-disciplinary, and sustained approach. The expanded Chronic Care Model (CCM),<sup>20</sup> which integrates population health promotion with the prevention and management of chronic disease, helps individuals cope with a disease and develop skills for health and wellness. CCM also provides strategies in the community and in the health system to support self-management. An individual’s ability to read, understand, and use health care information to make informed decisions about disease prevention, self-care, and treatment is one of the most important factors influencing health status.<sup>21</sup> Establish-

ing a patient’s level of health literacy is critical for determining how best to customize your approach. A quick and accurate primary care screening tool, the Newest Vital Sign, consists of six questions about a nutrition label.<sup>22</sup> Limited literacy is likely with four or more incorrect answers<sup>22</sup> and this undoubtedly translates into poor patient compliance with recommendations for changes in diet.

Clinicians can support self-management and help patients access appropriate, culturally sensitive, clear, and affordable resources and supports in the community. **Table 2** contains practical suggestions physicians can provide to patients, and resources they

**Table 2. Advice and resources for patients making key lifestyle changes that can help prevent and control hypertension.**

Advice	Resources
<p><b>Healthy Eating</b></p> <p><i>Provide patients with tips:</i></p> <ul style="list-style-type: none"> <li>• Be mindful about what and how much you eat and choose wisely from a variety of foods to improve your health and your blood pressure.</li> <li>• Eat more fruits and vegetables every day.</li> <li>• Choose a wide variety of brightly colored fresh or frozen vegetables.</li> <li>• Cook fresh foods from scratch as often as you can—it's easier than you think and tastes great.</li> <li>• Choose foods low in fat, sugar, and salt.</li> <li>• Learn how to read food labels.</li> <li>• Have regular meals and healthy snacks.</li> <li>• Quench your thirst with water.</li> </ul> <p><i>Consider adding a virtual dietitian to your team if one is not readily available to your practice.</i></p> <p><i>Encourage your patients to use the HealthLink BC website for self-management.</i></p>	<p><b>"Eating well with Canada's Food Guide"</b> describes an evidence-based food intake pattern.  <a href="http://www.healthcanada.gc.ca/foodguide">www.healthcanada.gc.ca/foodguide</a></p> <p><b>Health Canada Food and Nutrition</b> provides information about food safety and healthy eating.  <a href="http://www.hc-sc.gc.ca/fn-an/index-eng.php">www.hc-sc.gc.ca/fn-an/index-eng.php</a></p> <p><b>Healthy Families BC</b> has healthy eating resources for consumers of all ages.  <a href="http://www.healthyfamiliesbc.ca">www.healthyfamiliesbc.ca</a></p> <p><b>Food Skills for Families</b> is a hands-on program that makes healthy eating, shopping, and cooking easy, quick, and fun.  <a href="http://www.foodskillsforfamilies.ca/">www.foodskillsforfamilies.ca/</a></p> <p><b>Better Together</b> is about family, food, and fun.  <a href="http://bettertogetherbc.ca/">http://bettertogetherbc.ca/</a></p> <p><b>HealthLink BC</b> provides information on healthy eating.  <a href="http://www.healthlinkbc.ca">www.healthlinkbc.ca</a></p> <p><b>Dietitian Services at HealthLink BC</b> provides counseling/coaching support to assist patients with lifestyle changes. Doctors can refer patients, or patients can make contact directly. Call 811 and ask to speak to a dietitian (HealthLink BC telephone services are available in over 130 languages).</p>
<p><b>Sodium reduction</b></p> <p><i>Provide patients with tips:</i></p> <ul style="list-style-type: none"> <li>• Read nutrition labels. Almost all packaged foods have a Nutrition Facts table, making it easier to see how much sodium and other nutrients are in a food. The daily value (% DV) tells you at a glance if there is a lot (15% DV or more) or a little (5% DV or less) of a nutrient in the stated amount of food. Choose foods with less sodium.</li> <li>• Eat more fresh foods prepared at home. Choose plenty of fresh or frozen fruits and vegetables.</li> <li>• Eat fewer processed foods. Limit packaged and canned foods and meals purchased outside of the home. Watch for the hidden salt in foods such as lunch meat, canned soups, and pasta.</li> <li>• Look for foods with claims such as "salt-free" (less than 5 mg of sodium per serving), "low in sodium" (140 mg of sodium or less per serving), or "reduced in sodium" (at least 25% less than the regular product).</li> <li>• Prepare foods with little or no added salt and resist adding salt to your food. Remember that 5 mL (1 teaspoon) of salt contains 2300 mg of sodium. Try other flavoring agents such as pepper, vinegar, lemon, hot pepper sauce, and herbs.</li> <li>• Ask for nutrition information at restaurants to see how much sodium is in the food served. Many chains now make nutrition information available in restaurants or online.</li> </ul>	<p><b>Hypertension Canada</b> provides guidance on sodium reduction for both patients and health professionals through its Dietary Sodium Initiative. "Healthy Eating for Your Blood Pressure" is a good patient resource that can be found online or ordered free of charge.  <a href="http://www.lowersodium.ca/en/public/tools">www.lowersodium.ca/en/public/tools</a>          Send a message to <a href="mailto:admin@hypertension.ca">admin@hypertension.ca</a> to order resources.</p> <p><b>Healthy Families BC</b> provides information on sodium and how to read labels.  <a href="http://www.healthyfamiliesbc.ca/home/articles/salt-and-sodium-get-facts">www.healthyfamiliesbc.ca/home/articles/salt-and-sodium-get-facts</a></p> <p><b>Dietitian Services at HealthLink BC</b> can provide specific information about sodium reduction. Doctors can refer patients or patients can make contact directly. Call 811 and ask to speak to a dietitian.</p>

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**Table 2 (continued). Advice and resources for patients making key lifestyle changes that can help prevent and control hypertension.**

Advice	Resources
<p><b>Physical activity</b></p> <p><i>Provide patients with tips:</i></p> <ul style="list-style-type: none"> <li>• Increase your physical activity and reduce sedentary time. Include activities that you can easily incorporate into a daily routine, such as walking more, taking stairs instead of an elevator, playing with your children or grandchildren, dog walking, and gardening.</li> <li>• Something is better than nothing, and more is better. The more you do, the better your health and the better you feel.</li> </ul> <p><i>Consider adding a virtual exercise physiologist to your team if one is not readily available to your practice.</i></p>	<p><b>HealthLink BC</b> provides information on physical activity and some practical advice under “Fitness and Exercise.”  <a href="http://www.healthlinkbc.ca/healthyliving/?WT.svl=TopNav">www.healthlinkbc.ca/healthyliving/?WT.svl=TopNav</a></p> <p><b>Healthy Families BC</b> provides information on physical activity.  <a href="http://www.healthyfamiliesbc.ca/home/articles/physical-activity">www.healthyfamiliesbc.ca/home/articles/physical-activity</a></p> <p><b>PAL (Physical Activity Line)</b> provides counseling/coaching support from CSEP-certified exercise physiologists to help patients with health conditions exercise safely.  <a href="http://www.physicalactivityline.com">www.physicalactivityline.com</a>            Call 604 241-2266 (Lower Mainland) or toll free 1 877 725-1149 or send a message to PAL staff at <a href="mailto:info@physicalactivityline.com">info@physicalactivityline.com</a>.</p> <p><b>Exercise Is Medicine</b> provides information for both patients and health professionals.  <a href="http://exerciseismedicine.org/">http://exerciseismedicine.org/</a></p>
<p><b>Healthy weight</b></p> <p><i>Provide patients with tips:</i></p> <ul style="list-style-type: none"> <li>• Achieve and maintain a healthy weight through improved eating and physical activity. Be mindful about building healthy eating and living patterns to achieve caloric balance through all stages of life.</li> <li>• Incorporate physical activity into everyday life at home, at work, and at play.</li> <li>• Play actively with your children and friends.</li> <li>• Select an eating pattern that provides enough nutrients at an appropriate calorie level.</li> <li>• Be mindful of all foods and beverages consumed and how they fit within a total healthy eating pattern.</li> <li>• To lose weight, work with professionals to achieve a healthy weight and seek support from “buddies.” For long-term success, set realistic targets and limit weight loss to 0.5 kg (1 lb) per week.</li> <li>• To lose weight, increase the amount of time you are physically active or increase the amount of effort you put into the activity. Moderate physical activity for 150–250 minutes per week (e.g., walking briskly) will help. Being active for more than 250 minutes per week will help you lose even more weight.</li> </ul> <p><i>All overweight hypertensive patients should be advised to lose weight. Weight loss strategies should be long-term and employ a multidisciplinary approach that includes education, increased physical activity, and behavioral intervention.</i></p>	<p><b>The Canadian Obesity Network</b> provides resources for the primary care team, including <i>Best Weight: A Practical Guide to Office-Based Obesity Management</i> by Dr Yoni Freedhoff and Dr Arya M. Sharma, and the <i>5As of Obesity Management</i> toolkit.  <a href="http://www.obesitynetwork.ca">www.obesitynetwork.ca</a></p> <p><b>HealthLink BC</b> provides information on weight management.  <a href="http://www.healthlinkbc.ca/kb/content/special/aa122915.html">www.healthlinkbc.ca/kb/content/special/aa122915.html</a></p> <p><b>Centre for Healthy Weights: Shapedown BC</b> is a multidisciplinary family-centred program for pediatric weight management with a team that includes a physician, a registered dietitian, a psychologist, and a fitness/activity specialist.  <a href="http://www.bcchildrens.ca/Services/SpecializedPediatrics/CentreHealthyWeights/default.htm">www.bcchildrens.ca/Services/SpecializedPediatrics/CentreHealthyWeights/default.htm</a></p> <p><b>The Childhood Obesity Foundation</b> provides a simple guide to preventing childhood obesity, “What Every Family Can Do: The 5-2-1-0 Rule.”  <a href="http://www.childhoodobesityfoundation.ca/whatFamiliesCanDo">www.childhoodobesityfoundation.ca/whatFamiliesCanDo</a></p> <p><b>Live Right Now</b> is a national initiative designed to inspire Canadians to join together and change the health of this country. The idea is built around the small steps everyone can take to improve health.  <a href="http://www.cbc.ca/liverightnow">www.cbc.ca/liverightnow</a></p> <p><b>Dietician Services at HealthLink BC</b> provides counseling/coaching support to assist patients with lifestyle changes. Call 811 and ask to speak to a registered dietitian who is a weight-loss coach (a pediatric dietitian is also available to support families with children/youth who have weight management issues). Doctors can refer patients or patients can make contact directly.</p> <p><b>PAL (Physical Activity Line)</b> provides counseling/coaching support to help patients achieve a healthy weight. Doctors can refer patients or patients can make contact directly.            Call 604 241-2266 (Lower Mainland) or toll free 1 877 725-1149 or send a message to PAL staff at <a href="mailto:info@physicalactivityline.com">info@physicalactivityline.com</a>.</p>
<p><b>Moderate alcohol consumption</b></p> <p><i>Offer advice and support to patients who drink more than the guidelines for moderate drinking recommend (two drinks per day for men; one drink per day for women; no alcohol during pregnancy).</i></p>	<p><b>The Alcohol and Drug Information and Referral Service</b> provides information for people across BC needing help with any kind of substance abuse. Call 604 660-9382 (Lower Mainland) or toll free 1 800 663-1441 for referral to education, prevention, and treatment services, and to contact regulatory agencies.</p>

**Table 2 (continued). Advice and resources for patients making key lifestyle changes that can help prevent and control hypertension.**

Advice	Resources
<p><b>Stress management</b></p> <p><i>Offer advice and support to patients struggling with stress or mental health challenges. Recommend resources and make referrals when necessary.</i></p>	<p><b>Canadian Mental Health Association, BC Division</b>, provides <i>Bounce Back: Reclaim Your Health</i>, a free program designed to help adults experiencing mild to moderate depression, low mood, or stress, with or without anxiety. The program DVDs, available in English, Mandarin, and Cantonese, are supplied to physicians to give to their patients. The guided self-help telephone coaching with skill-building workbooks requires a doctor's referral. Call toll free 1 866 639-0522 or send a message to <a href="mailto:bounceback@cmha.bc.ca">bounceback@cmha.bc.ca</a>. <a href="http://www.bouncebackbc.ca">www.bouncebackbc.ca</a></p> <p><b>Canadian Mental Health Association, BC Division</b>, also provides <i>Living Life to the Full</i>, a course to help adults deal with everyday life challenges and stress (material available on the website and 90-minute classes, once a week, for 8 weeks, available in a group format). Call toll free 1 800 555-8222 or send a message to <a href="mailto:living.life@cmha.bc.ca">living.life@cmha.bc.ca</a>. <a href="http://www.lttf.ca">www.lttf.ca</a></p>

can recommend to manage the key lifestyle modifications that will help prevent and control hypertension: healthy eating, sodium reduction, physical activity, healthy weight, moderate alcohol consumption, and stress management. Two province-wide services are highly recommended as evidence-based practice supports for physicians who do not have ready access to registered dietitians and CSEP-certified exercise physiologists for their patients—Dietitian Services at HealthLink BC and the Physical Activity Line (PAL).

**Summary**

Once appropriate BP measurement has confirmed a diagnosis of hypertension, clinical assessment and routine laboratory testing can stratify the patient's risk by identifying any associated conditions or hypertension-induced target organ damage. Following risk stratification, lifestyle changes should be recommended for all patients with hypertension. A large number of resources are available to help clinicians support patient lifestyle changes and self-management that can aid in controlling blood pressure.

**Competing interests**

None declared.

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