

THE 2013 CANADIAN HYPERTENSION EDUCATION PROGRAM RECOMMENDATIONS

(FULL VERSION)



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| PART 1

DIAGNOSIS & ASSESSMENT

I ACCURATE MEASUREMENT OF BLOOD PRESSURE

- 1) Health care professionals who have been specifically trained to measure blood pressure (BP) accurately should assess BP in all adult patients at all appropriate visits to determine cardiovascular risk and monitor antihypertensive treatment (Grade D).
- 2) Use of standardized measurement techniques (Table 1) is recommended when assessing blood pressure (Grade D).
- 3) Automated office blood pressure measurements can be used in the assessment of office blood pressure (Grade D).
- 4) When used under proper conditions, automated office systolic (SBP) of 135 mmHg or higher or diastolic BP (DBP) values of 85 mmHg or higher should be considered analogous to mean awake ambulatory SBP of 135 mmHg or higher and DBP of 85 mmHg or higher, respectively (Grade D).

II CRITERIA FOR DIAGNOSIS OF HYPERTENSION AND RECOMMENDATIONS FOR FOLLOW-UP

- 1) At initial presentation, patients demonstrating features of a hypertensive urgency or emergency (Table 2) should be diagnosed as hypertensive and require management (Grade D).
- 2) If SBP is ≥ 140 mmHg and/or DBP is ≥ 90 mmHg, a specific visit should be scheduled for the assessment of hypertension (Grade D). If BP is high-normal (SBP 130-139 mmHg and/or DBP 85-89 mmHg), annual follow-up is recommended (Grade C).
- 3) At the initial visit for the assessment of hypertension, if SBP is ≥ 140 and/or DBP is ≥ 90 mmHg, at least two more readings should be taken during the same visit using a validated device and according to the recommended procedure for accurate BP determination (Table 1). The first reading should be discarded and the latter two averaged. A history and physical examination should be performed and, if clinically indicated, diagnostic tests to search for target organ damage (Table 3) and associated cardiovascular risk factors (Table 4) should be arranged within two visits. Exogenous factors that can induce or aggravate hypertension should be assessed and removed if possible (Table 5). Schedule visit two within one month (Grade D).
- 4) At visit 2 for the assessment of hypertension, patients with macrovascular target organ damage, diabetes mellitus, or chronic kidney disease (CKD; $\text{GFR} < 60 \text{ ml/min/1.73m}^2$)

can be diagnosed as hypertensive if SBP is ≥ 140 mmHg and/or DBP is ≥ 90 mmHg (Grade D).

- 5) At visit 2 for the assessment of hypertension, patients without macrovascular target organ damage, diabetes mellitus, or CKD can be diagnosed as hypertensive if the SBP is ≥ 180 mmHg and/or the DBP is ≥ 110 mmHg (Grade D). Patients without macrovascular target organ damage, diabetes mellitus, or CKD but with lower BP levels should undergo further evaluation using any of the three approaches outlined below:
 - i) **Office manual BPs:**
Using office manual BP measurements, patients can be diagnosed as hypertensive if the SBP is ≥ 160 mmHg or the DBP is ≥ 100 mmHg averaged across the first 3 visits, or if the SBP averages ≥ 140 mmHg or the DBP averages ≥ 90 mmHg averaged across 5 visits (Grade D).
 - ii) **Ambulatory BP monitoring (ABPM):**
Using ABPM (see Section VIII), patients can be diagnosed as hypertensive if the mean awake SBP is ≥ 135 mmHg or the DBP is ≥ 85 mmHg or if the mean 24 h SBP is ≥ 130 mmHg or the DBP is ≥ 80 mmHg (Grade C).
 - iii) **Home BP Measurement (HBPM):**
Using home BP measurements (see recommendation Home Measurement of BP), patients can be diagnosed as hypertensive if the average SBP is ≥ 135 mmHg or the DBP is ≥ 85 mmHg (Grade C). If the average home BP is $< 135/85$ mmHg, **it is advisable to either repeat home monitoring to confirm the home BP is $< 135/85$ mmHg** or perform 24-hour ABPM to confirm that the mean 24-hour ABPM is $< 130/80$ mmHg and the mean awake ABPM is $< 135/85$ mmHg before diagnosing white coat hypertension (Grade D).
- 6) Investigations for secondary causes of hypertension should be initiated in patients with suggestive clinical and/or laboratory features (outlined below) (Grade D).
- 7) If at the last diagnostic visit the patient is not diagnosed to be hypertensive, and has no evidence of macrovascular target organ damage, the patient's BP should be assessed at yearly intervals (Grade D).
- 8) Hypertensive patients receiving lifestyle modification advice alone (nonpharmacological treatment) should be followed up at three to six month intervals. Shorter intervals (every one or two months) are needed for patients with higher BPs (Grade D).

- 9) Patients on antihypertensive drug treatment should be seen monthly or every two months, depending on the level of BP, until readings on two consecutive visits are below their target (Grade D). Shorter intervals between visits will be needed for symptomatic patients and those with severe hypertension, intolerance to antihypertensive drugs or target organ damage (Grade D). Once the target BP has been reached, patients should be seen at three-to six month intervals (Grade D).

III ASSESSMENT OF OVERALL CARDIOVASCULAR RISK IN HYPERTENSIVE PATIENTS

- 1) Global cardiovascular risk should be assessed. Multifactorial risk assessment models can be used to predict more accurately an individual's global cardiovascular risk (Grade A) and to use antihypertensive therapy more efficiently (Grade D). In the absence of Canadian data to determine the accuracy of risk calculations, avoid using absolute levels of risk to support treatment decisions (Grade C).
- 2) Consider informing patients of their global risk to improve the effectiveness of risk factor modification (Grade B). Consider also using analogies that describe comparative risk such as "Cardiovascular Age", "Vascular Age" or "Heart Age" to inform patients of their risk status (Grade B).

IV ROUTINE AND OPTIONAL LABORATORY TESTS FOR THE INVESTIGATION OF PATIENTS WITH HYPERTENSION

- 1) Routine laboratory tests that should be performed for the investigation of all patients with hypertension include:
 - i) urinalysis (Grade D)
 - ii) blood chemistry (potassium, sodium, and creatinine) (Grade D);
 - iii) fasting blood glucose (Grade D);
 - iv) fasting serum total cholesterol and high density lipoprotein cholesterol, low density
 - v) lipoprotein cholesterol and triglycerides (Grade D); and standard 12-lead electrocardiography (Grade C).
- 2) Assess urinary albumin excretion in patients with diabetes (Grade D).
- 3) All treated hypertensive patients should be monitored according to the current Canadian Diabetes Association (CDA) guidelines for the new appearance of diabetes (Grade B)

- 4) During the maintenance phase of hypertension management, tests (including those for electrolytes, creatinine and fasting lipids), should be repeated with a frequency reflecting the clinical situation (Grade D).

V ASSESSMENT FOR RENOVASCULAR HYPERTENSION

- 1) Patients presenting with two or more of the clinical clues listed below, suggesting renovascular hypertension, should be investigated (Grade D).
 - i) sudden onset or worsening of hypertension and age greater than 55 or less than 30 years;
 - ii) the presence of an abdominal bruit;
 - iii) hypertension resistant to three or more drugs;
 - iv) a rise in serum creatinine level of $\geq 30\%$ associated with use of an angiotensin-converting enzyme inhibitor or angiotensin II receptor antagonist;
 - v) other atherosclerotic vascular disease, particularly in patients who smoke or have dyslipidemia;
 - vi) recurrent pulmonary edema associated with hypertensive surges.
- 2) When available, the following tests are recommended to aid in the usual screening for renal vascular disease: captopril-enhanced radioisotope renal scan, Doppler sonography, magnetic resonance angiography and CT-angiography (for those with normal renal function) (Grade B). Captopril-enhanced radioisotope renal scan is not recommended for those with CKD (GFR < 60 mL/min/1.73 m²). (Grade D).

VI ENDOCRINE HYPERTENSION

A. Hyperaldosteronism: Screening and Diagnosis:

- 1) Screening for hyperaldosteronism should be considered for the following patients (Grade D):
 - i) hypertensive patients with spontaneous hypokalemia (K⁺ less than 3.5 mmol/L);
 - ii) hypertensive patients with marked diuretic-induced hypokalemia (K⁺ less than 3.0 mmol/L);
 - iii) patients with hypertension refractory to treatment with three or more drugs; and
 - iv) hypertensive patients found to have an incidental adrenal adenoma.
- 2) Screening for hyperaldosteronism should include assessment of plasma aldosterone and plasma renin activity (see online table "Hyperaldosteronism: Screening and diagnosis").

- 3) For patients with suspected hyperaldosteronism [on the basis of the screening test, Online Table (iii)], a diagnosis of primary aldosteronism should be established by demonstrating inappropriate autonomous hypersecretion of aldosterone using at least one of the maneuvers listed in Online Table (iv). When the diagnosis is established, the abnormality should be localized using any of the tests described in Online Table (v).

B) Pheochromocytoma : Screening and Diagnosis :

- 1) If pheochromocytoma is strongly suspected, the patient should be referred to a specialized hypertension center, particularly if biochemical screening tests (see online table "Pheochromocytoma: Screening and diagnosis") have already been found to be positive (Grade D).
- 2) The following patients should be considered for screening for pheochromocytoma (Grade D):
 - i) patients with paroxysmal and/or severe (BP \geq 180/110 mmHg) sustained hypertension refractory to usual antihypertensive therapy;
 - ii) patients with hypertension and multiple symptoms suggestive of catecholamine excess (e.g., headaches, palpitations, sweating, panic attacks and pallor);
 - iii) patients with hypertension triggered by beta-blockers, monoamine oxidase inhibitors, micturition, or changes in abdominal pressure; and
 - iv) patients with incidentally discovered adrenal mass, patients with hypertension and multiple endocrine neoplasia (MEN) 2A or 2B, von Recklinghausen's neurofibromatosis, or von Hippel-Lindau disease.
 - v) for patients with positive biochemical screening tests, localization of pheochromocytomas should employ magnetic resonance imaging (preferable), computed tomography (if MRI unavailable), and/or iodine I-131 metaiodobenzylguanidine (MIBG) scintigraphy (Grade C for each modality).

VII HOME MEASUREMENT OF BP

- 1) HBPM can be used in the diagnosis of hypertension (Grade C).
- 2) The use of HBPM on a regular basis should be considered for patients with hypertension, particularly those with:
 - i) diabetes mellitus (Grade D);
 - ii) chronic kidney disease (Grade C);
 - iii) suspected non-adherence (Grade D);
 - iv) demonstrated white coat effect (Grade C); and

- v) BP controlled in the office but not at home (masked hypertension) (Grade C).
- 3) When white coat hypertension is suggested by HBPM, its presence should be confirmed **by repeat HBPM (see recommendation 8)** or ABPM before treatment decisions are made (Grade D).
- 4) Patients should be advised to purchase and use only home BP monitoring devices that are appropriate for the individual and that have met standards of the Association for the Advancement of Medical Instrumentation, the most recent requirements of the British Hypertension Society protocol or the International Protocol for validation of automated BP measuring devices. Patients should be encouraged to use devices with data recording capabilities or automatic data transmission to increase the reliability of reported home BP values. (Grade D).
- 5) Home SBP values ≥ 135 mmHg or DBP values ≥ 85 mmHg should be considered elevated and associated with an increased overall mortality risk analogous to office SBP readings of ≥ 140 mmHg or DBP ≥ 90 mmHg (Grade C).
- 6) Health care professionals should ensure that patients who measure their BP at home have adequate training, and if necessary, repeat training in measuring their BP. Patients should be observed to determine that they measure BP correctly and should be given adequate information about interpreting these readings (Grade D).
- 7) The accuracy of all individual patients' validated devices (including electronic devices) must be regularly checked against a device of known calibration (Grade D).
- 8) Home BP values for assessing white coat hypertension or sustained hypertension should be based on duplicate measures, morning and evening, for an initial seven-day period. First day home BP values should not be considered (Grade D).

VIII AMBULATORY BLOOD PRESSURE MEASUREMENT

- 1) Ambulatory BP readings can be used in the diagnosis of hypertension (Grade C). ABPM should be considered when an office-induced increase in BP is suspected in treated patients with:
 - i) BP that is not below target despite receiving appropriate chronic anti-hypertensive therapy (Grade C);
 - ii) symptoms suggestive of hypotension (Grade C); or
 - iii) fluctuating office BP readings (Grade D).

- 2) Physicians should use only ABPM devices that have been validated independently using established protocols (Grade D).
- 3) Therapy adjustment should be considered in patients with a mean 24h ambulatory SBP of ≥ 130 mmHg or DBP of ≥ 80 mmHg or a mean awake SBP of ≥ 135 mmHg or DBP of ≥ 85 mmHg (Grade D).
- 4) The magnitude of changes in nocturnal BP should be taken into account in any decision to prescribe or withhold drug therapy based upon ambulatory BP (Grade C) because a decrease in nocturnal blood pressure of less than 10% is associated with increased risk of CV events.

IX ROLE OF ECHOCARDIOGRAPHY

- 1) Routine echocardiographic evaluation of all hypertensive patients is not recommended. (Grade D).
- 2) An echocardiogram for assessment of left ventricular hypertrophy is useful in selected cases to help define the future risk of cardiovascular events (Grade C).
- 3) Echocardiographic assessment of left ventricular mass as well as of systolic and diastolic left ventricular function is recommended for hypertensive patients suspected to have left ventricular dysfunction or coronary artery disease (Grade D).
- 4) Patients with hypertension and evidence of heart failure should have an objective assessment of left ventricular ejection fraction, either by echocardiogram or nuclear imaging (Grade D).

DIAGNOSIS & ASSESSMENT TABLES

TABLE 1: Recommended Technique for Measuring Blood Pressure in the Office*

- i) Measurements should be taken with a sphygmomanometer known to be accurate. A recently calibrated aneroid or a validated electronic device can be used. Aneroid devices or mercury columns need to be clearly visible at eye level.
- ii) Choose a cuff with an appropriate bladder size matched to the size of the arm. For measurements taken by auscultation, bladder width should be close to 40% of arm circumference and bladder length should cover 80 – 100% of arm circumference. When using an automated device, select the cuff size as recommended by its manufacturer.

- iii) Place the cuff so that the lower edge is 3 cm above the elbow crease and the bladder is centered over the brachial artery. The patient should be resting comfortably for 5 minutes in the seated position with back support. The arm should be bare and supported with the BP cuff at heart level, as a lower position will result in an erroneously higher SBP and DBP. There should be no talking, and patients' legs should not be crossed. At least three measurements should be taken in the same arm with the patient in the same position. The first reading should be discarded and the latter two averaged. Blood pressure also should be assessed after 2 minutes standing (with arm supported) and at times when patients report symptoms suggestive of postural hypotension. Supine BP measurements may also be helpful in the assessment of elderly and diabetic patients. For auscultation, at least three measurements should be taken in the same arm with the patient in the same position. The first reading should be discarded and the latter two averaged.

When using automated office oscillometric devices such as the BpTRU (VSM MedTech Ltd, Vancouver, Canada), the patient should be seated in a quiet room (no specified period of rest). With the device set to take measures at 1- or 2-minute intervals, the first measurement is taken by a health professional to verify cuff position and validity of the measurement. The patient is left alone after the first measurement while the device automatically takes subsequent readings. The BpTRU automatically discards the first measure and averages the next 5 measures.

Steps 4 to 7 are specific to auscultation:

- iv) Increase the pressure rapidly to 30 mmHg above the level at which the radial pulse is extinguished (to exclude the possibility of a systolic auscultatory gap).
- v) Place the bell or diaphragm of the stethoscope gently and steadily over the brachial artery.
- vi) Open the control valve so that the rate of deflation of the cuff is approximately 2 mmHg per heart beat. A cuff deflation rate of 2 mmHg per beat is necessary for accurate systolic and diastolic estimation.
- vii) Read 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 4 Korotkoff]). If Korotkoff sounds persist as the level approaches 0 mmHg, then the point of muffling of the sound is used (phase IV) to indicate the diastolic pressure. Leaving the cuff partially inflated for too long will fill the venous system and make the sounds difficult to hear. To

avoid venous congestion, it is recommended that at least one minute should elapse between readings.

- viii) Record the blood pressure to the closest 2 mmHg on the manometer (or 1 mmHg on electronic devices) as well as the arm used and whether the patient was supine, sitting or standing. Avoid digit preference by not rounding up or down. Record the heart rate. The seated blood pressure is used to determine and monitor treatment decisions. The standing blood pressure is used to examine for postural hypotension, if present, which may modify the treatment.
- ix) In the case of arrhythmia, additional readings with auscultation may be required to estimate the average systolic and diastolic pressure. Isolated extra beats should be ignored. Note the rhythm and pulse rate.
- x) Blood pressure should be taken in both arms on at least one visit and if one arm has a consistently higher pressure, that arm should be subsequently used for blood pressure measurement and interpretation.

**** Unless specifically mentioned, steps apply to measurement by auscultation and oscillometry using an upper arm cuff. Re-printed with permission of CHEP.***

TABLE 2: Examples of Hypertensive Urgencies and Emergencies*

- Asymptomatic diastolic BP \geq 130 mmHg
- Severe elevations of BP in the setting of any of:
 - Hypertensive encephalopathy
 - Acute aortic dissection
 - Acute left ventricular failure
 - Acute coronary syndrome
 - Acute kidney injury
 - Intracranial hemorrhage
 - Acute ischemic stroke
 - Eclampsia of pregnancy

TABLE 3: Examples of Target Organ Damage*

Cerebrovascular Disease

Stroke

- Ischemic stroke and transient ischemic attack
- Intracerebral hemorrhage
- Aneurysmal sub-arachnoid hemorrhage

Dementia

- Vascular dementia
- Mixed vascular dementia and dementia of the Alzheimer's type

Hypertensive Retinopathy

Left Ventricular Dysfunction

- Left Ventricular Hypertrophy

Coronary Artery Disease

- Myocardial infarction
- Angina pectoris
- Congestive heart failure

Renal Disease

- Chronic Kidney Disease (GFR < 60 ml/min/1.73 m²)
- Albuminuria

Peripheral Artery disease

- Intermittent claudication

TABLE 4: Examples of Key Cardiovascular Risk Factors for Atherosclerosis *

Prior history of clinically overt atherosclerotic disease indicates a very high risk for a recurrent atherosclerotic event (e.g., Peripheral arterial disease, previous stroke or TIA).

Non-Modifiable

- Age ≥ 55 years
- Male
- Family history of premature cardiovascular disease (age < 55 in men and < 65 in women)

Modifiable

- Sedentary lifestyle
- Poor dietary habits
- Abdominal obesity
- Dysglycemia
- Smoking
- Dyslipidemia
- Stress
- Nonadherence

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TABLE 5: Examples of exogenous factors that can induce/ aggravate hypertension*

Prescription Drugs:

- NSAIDs, including coxibs
- Corticosteroids and anabolic steroids
- Oral contraceptives and sex hormones
- Vasoconstricting/sympathomimetic decongestants
- Calcineurin inhibitors (cyclosporin, tacrolimus)
- Erythropoietin and analogues
- Antidepressants: Monoamine oxidase inhibitors (MAOIs), serotonin-norepinephrine reuptake inhibitors (SNRIs), selective serotonin reuptake inhibitors (SSRIs)
- Midodrine

Other substances:

- Licorice root
- Stimulants including cocaine
- Salt
- Excessive alcohol use

ONLINE TABLE:

Hyperaldosteronism: Screening and diagnosis*

- i) Plasma aldosterone and plasma renin activity (see ii below for conversion factors) should be measured under standardized conditions, including the collection of morning samples taken from patients in a sitting position after resting at least 15 minutes. Antihypertensive drugs may be continued, with the exception of aldosterone antagonists, angiotensin receptor blockers, beta-adrenergic antagonists and clonidine.
- ii) Renin, Aldosterone and Ratio Conversion Factors:

(A) To estimate:	(B) From:	Multiply (B) by:
Plasma renin concentration (ng/mL)	Plasma renin activity (ng/mL/hr)	0.206
Plasma renin activity (g/L/sec)	Plasma renin activity (ng/mL/hr)	0.278
Plasma aldosterone concentration (pmol/L)	Plasma aldosterone concentration (ng/dL)	28

- iii) Definition of a positive screening test: plasma aldosterone to renin activity ratio greater than 550 pmol/L/ng/ml/hr (or 140 pmol/L/ng/L when renin is measured as renin mass or concentration).

- iv) Maneuvers to demonstrate autonomous hyper-secretion of aldosterone:
 - a) saline loading tests (2L of normal saline over 4 h with primary aldosteronism defined as failure to suppress plasma aldosterone to less than 280 pmol/L; or oral sodium 300 mmol/day for three days with primary aldosteronism defined as failure to suppress plasma aldosterone to less than 240 pmol/Lth);
 - b) fludrocortisone suppression test (oral sodium loading plus oral fludrocortisone 0.25 mg per day for 2 days) positive for primary aldosteronism: plasma aldosterone of 140 pmol/l or greater in upright and/or supine positions;
 - c) a plasma aldosterone to PRA ratio greater than 1400 pmol/L/ng/ml/hr with a plasma aldosterone greater than 440 pmol/L; and
 - d) captopril suppression test (primary aldosteronism defined as failure to suppress plasma aldosterone to less than 240 pmol/L two hours after 25 mg of oral captopril).
- v) Differentiating potential causes of primary aldosteronism:
 - a) For patients with established primary aldosteronism attempts to differentiate potential causes should be made and may include localization with adrenal CT-scan (standard: 3 mm contiguous cuts) or magnetic resonance imaging (where available), or assessment of plasma aldosterone before (supine) and after 2 h to 4 h of upright posture.
 - b) For patients with established primary aldosteronism and negative imaging studies, selective adrenal venous sampling should be considered because it may be the only way to reliably differentiate unilateral from bilateral overproduction of aldosterone. Adrenal venous sampling should be conducted in centres with experience in performing this diagnostic technique.

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ONLINE TABLE

Pheochromocytoma: Screening and diagnosis*

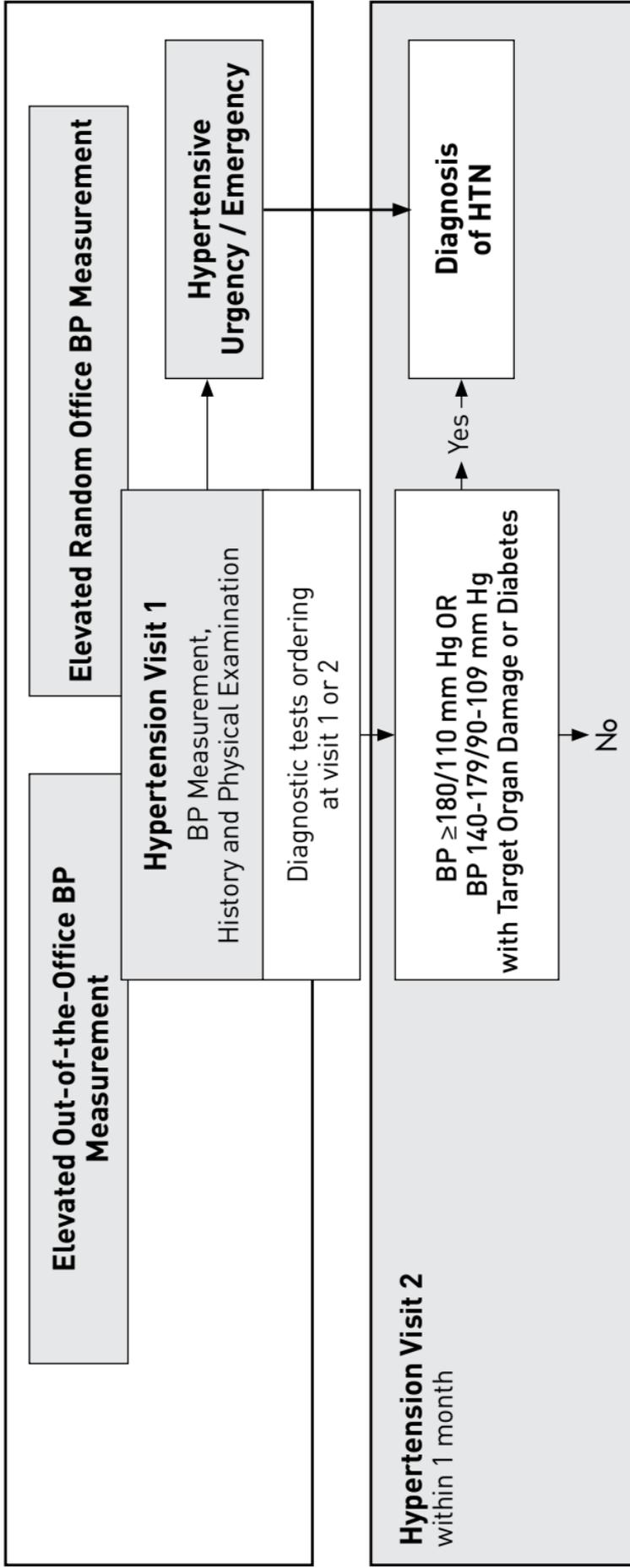
Biochemical screening tests for pheochromocytomas:

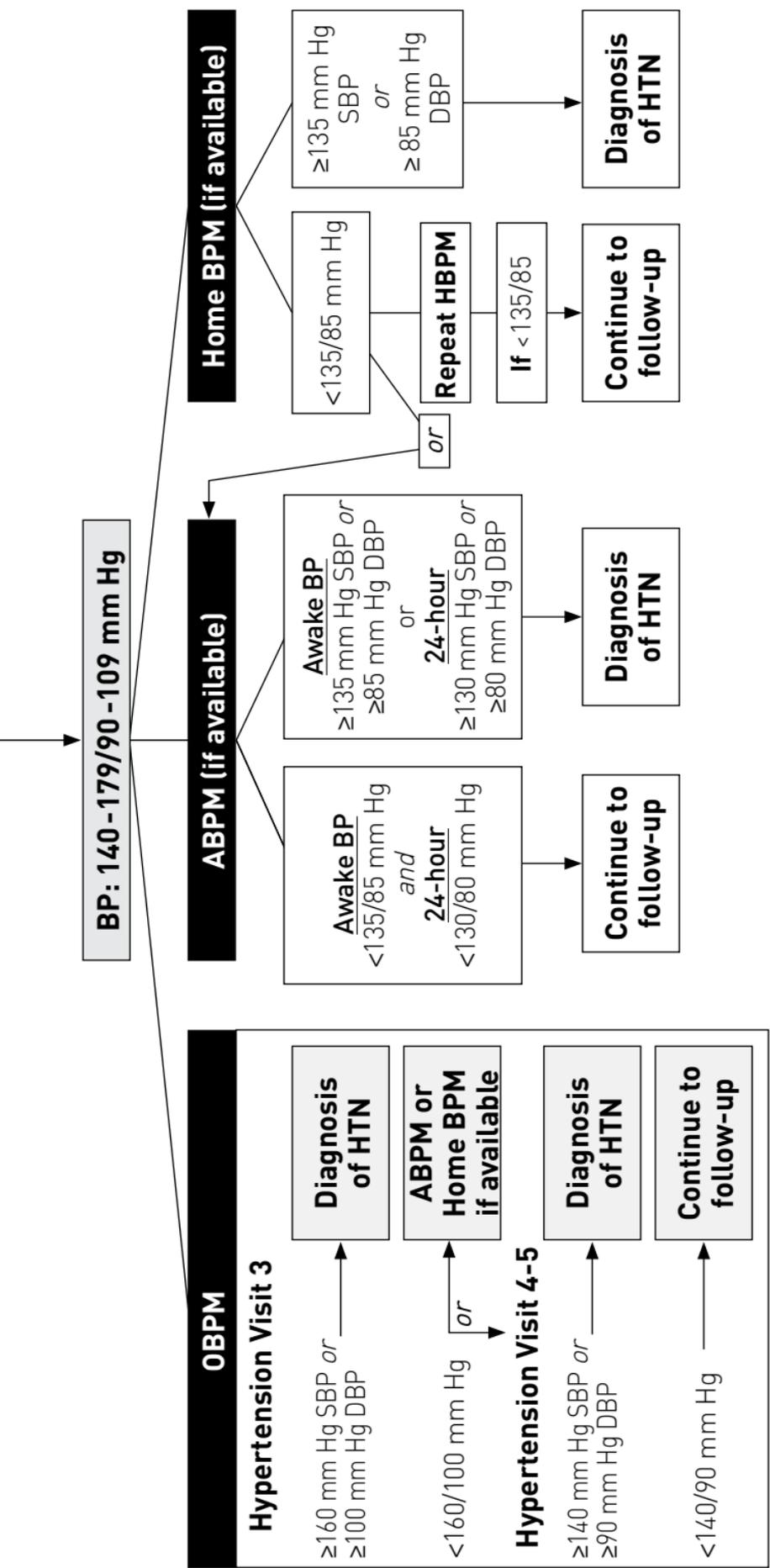
- a) To screen for pheochromocytomas, 24 h urinary total metanephrines (sensitivity 95%) and urinary metanephrine-to-creatinine ratio (sensitivity 100%) should be assessed. Plasma catecholamines and, where available, plasma metanephrines may also be considered if clinical suspicion is high, particularly during a hypertensive episode or for those with familial forms. Urinary or plasma VMA measurements should not be used as screening tests. In a low risk setting, plasma fractionated free metanephrine measurements can be used to rule out pheochromocytoma.
- b) In the presence of borderline biochemical test results (e.g., plasma noradrenaline and adrenaline levels of approximately 500ng/L to 2000 ng/L) or potentially false positive results, repeated testing and/or the clonidine suppression test may be used.

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Figure 1: The Expedited Assessment and Diagnosis of Patients with Hypertension: Focus on Validated Technologies for Blood Pressure Assessment*







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| PART 2

THERAPY

I HEALTH BEHAVIOUR MANAGEMENT

A) Physical Exercise

- 1) For non-hypertensive individuals (to reduce the possibility of becoming hypertensive) or for hypertensive patients (to reduce their blood pressure), prescribe the accumulation of 30 to 60 minutes of moderate intensity dynamic exercise (such as walking, jogging, cycling or swimming) four to seven days per week in addition to the routine activities of daily living (Grade D). Higher intensities of exercise are no more effective (Grade D). For non-hypertensive or stage 1 hypertensive individuals, the use of resistance or weight training exercise (such as free weight lifting, fixed-weight lifting, or handgrip exercise) does not adversely influence BP (Grade D).

B) Weight Reduction

- 1) Height, weight, and waist circumference should be measured and body mass index calculated for all adults (Grade D).
- 2) Maintenance of a healthy body weight (body mass index 18.5 to 24.9 kg/m² and waist circumference less than 102 cm for men and less than 88 cm for women) is recommended for non-hypertensive individuals to prevent hypertension (Grade C) and for hypertensive patients to reduce blood pressure (Grade B). All overweight hypertensive individuals should be advised to lose weight (Grade B).
- 3) Weight loss strategies should employ a multidisciplinary approach that includes dietary education, increased physical activity and behavioural intervention (Grade B).

C) Alcohol Consumption

- 1) To reduce blood pressure, alcohol consumption should be in accordance with Canadian low risk drinking guidelines in both normotensive and hypertensive individuals. Healthy adults should limit alcohol consumption to two drinks or less per day, and consumption should not exceed 14 standard drinks per week for men and nine standard drinks per week for women (Grade B). (Note: one standard drink is considered 13.6 g or 17.2 ml of ethanol, or approximately 44 mL [1.5 oz] of 80 proof [40%] spirits, 355 mL [12 oz] of 5% beer or 148 mL [5 oz] of 12% wine.)

D) Dietary Recommendations

- 1) It is recommended 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 that is reduced in saturated fat and cholesterol (Dietary Approaches to Stop Hypertension [DASH] diet; Table 1) (Grade B).

E) Sodium Intake

- 1) For prevention and treatment of hypertension, a dietary sodium intake of 1500 mg (65 mmol) per day is recommended for adults age 50 years or less; 1300 mg (57 mmol) per day if age 51 to 70 years; and 1200 mg (52 mmol) per day if age greater than 70 years (Grade B).

F) Potassium, Calcium and Magnesium Intake

- 1) Supplementation of potassium, calcium and magnesium is not recommended for the prevention or treatment of hypertension (Grade B).

G) Stress Management

- 1) In hypertensive patients in whom stress may be contributing to blood pressure elevation, stress management should be considered as an intervention (Grade D). Individualized cognitive behavioural interventions are more likely to be effective when relaxation techniques are employed (Grade B).

II INDICATIONS FOR DRUG THERAPY FOR ADULTS WITH HYPERTENSION WITHOUT COMPELLING INDICATIONS FOR SPECIFIC AGENTS

- 1) Antihypertensive therapy should be prescribed for average diastolic blood pressures of 100 mmHg or higher (Grade A), or average systolic blood pressures of 160 mmHg or higher (Grade A) in patients without macrovascular target organ damage or other cardiovascular risk factors.
- 2) Antihypertensive therapy should be strongly considered if diastolic blood pressure readings average 90 mmHg or higher in the presence of macrovascular target organ damage or other independent cardiovascular risk factors (Grade A).
- 3) Antihypertensive therapy should be strongly considered if systolic blood pressure readings average 140 mmHg or higher in the presence of macrovascular target organ damage (Grade C for 140 mmHg to 160 mmHg; Grade A for higher than 160 mmHg).
- 4) Antihypertensive therapy should be considered in all patients meeting the above indications regardless of age

(Grade B). Caution should be exercised in elderly patients who are frail.

III CHOICE OF THERAPY FOR ADULTS WITH HYPERTENSION WITHOUT COMPELLING INDICATIONS FOR SPECIFIC AGENTS

A) Recommendations for Individuals with Diastolic and/or Systolic Hypertension

- 1) Initial therapy should be monotherapy with a thiazide diuretic (Grade A); a beta-blocker (in patients younger than 60 years, Grade B); an ACE inhibitor (in nonblack patients, Grade B); a long-acting CCB (Grade B); or an ARB (Grade B). If there are adverse effects, another drug from this group should be substituted. Hypokalemia should be avoided in patients treated with thiazide diuretic monotherapy (Grade C).
- 2) Additional antihypertensive drugs should be used if target blood pressure levels are not achieved with standard-dose monotherapy (Grade B). Add-on drugs should be chosen from first-line choices. Useful choices include a thiazide diuretic or CCB with either an ACE inhibitor, ARB or betablocker (Grade B for the combination of thiazide diuretic and a dihydropyridine CCB; Grade C for the combination of dihydropyridine CCB and ACE inhibitor; and Grade D for all other combinations). Caution should be exercised in combining a nondihydropyridine CCB and a betablocker (Grade D). The combination of an ACE inhibitor and ARB is not recommended (Grade A).
- 3) Combination therapy using two first-line agents may also be considered as initial treatment of hypertension (Grade C) if systolic blood pressure is 20 mmHg above target or if diastolic blood pressure is 10 mmHg above target. However, caution should be exercised in patients in whom a substantial fall in blood pressure from initial combination therapy is more likely to occur or in whom it would be poorly tolerated (e.g. elderly patients).
- 4) If blood pressure is still not controlled with a combination of two or more first-line agents, or there are adverse effects, other antihypertensive drugs may be added (Grade D).
- 5) Possible reasons for poor response to therapy (Table 2) should be considered (Grade D).
- 6) Alpha-blockers are not recommended as first-line agents for uncomplicated hypertension (Grade A); beta-blockers are not recommended as first-line therapy for uncomplicated hypertension in patients 60 years of age or older (Grade A); and ACE inhibitors are not recommended as first-line therapy

for uncomplicated hypertension in black patients (Grade A). However, these agents may be used in patients with certain co morbid conditions or in combination therapy.

B) Recommendations for Individuals with Isolated Systolic Hypertension

- 1) Initial therapy should be monotherapy with a thiazide diuretic (Grade A), a long-acting dihydropyridine CCB (Grade A) or an ARB (Grade B). If there are adverse effects, another drug from this group should be substituted. Hypokalemia should be avoided in patients treated with thiazide diuretic monotherapy (Grade C).
- 2) Additional antihypertensive drugs should be used if target blood pressure levels are not achieved with standard-dose monotherapy (Grade B). Add-on drugs should be chosen from first-line options (Grade D).
- 3) If blood pressure is still not controlled with a combination of two or more first-line agents, or there are adverse effects, other classes of drugs (such as alpha-blockers, ACE inhibitors, centrally acting agents or nondihydropyridine CCBs) may be added or substituted (Grade D).
- 4) Possible reasons for poor response to therapy (Table 2) should be considered (Grade D).
- 5) Alpha-blockers are not recommended as first-line agents for uncomplicated isolated systolic hypertension (Grade A); beta-blockers are not recommended as first-line therapy for isolated systolic hypertension in patients aged 60 years of age or older (Grade A). However, both agents may be used in patients with certain co morbid conditions or in combination therapy.
- 6) In the very elderly (age 80 years and older), the target for systolic BP should be < 150 mmHg (Grade C)

IV GLOBAL VASCULAR PROTECTION THERAPY FOR ADULTS WITH HYPERTENSION WITHOUT COMPELLING INDICATIONS FOR SPECIFIC AGENTS

- 1) Statin therapy is recommended in hypertensive patients with three or more cardiovascular risk factors as defined in Table 3 (Grade A in patients older than 40 years), or with established atherosclerotic disease (Grade A regardless of age).
- 2) Strong consideration should be given to the addition of low-dose acetylsalicylic acid therapy in hypertensive patients (Grade A in patients older than 50 years). Caution should be exercised if blood pressure is not controlled (Grade C).

V GOAL OF THERAPY FOR ADULTS WITH HYPERTENSION WITHOUT COMPELLING INDICATIONS FOR SPECIFIC AGENTS

- 1) The systolic blood pressure treatment goal is a pressure level of less than 140 mmHg (Grade C). The diastolic blood pressure treatment goal is a pressure level of less than 90 mmHg (Grade A).

VI TREATMENT OF HYPERTENSION IN ASSOCIATION WITH ISCHEMIC HEART DISEASE

A) Recommendations for Hypertensive Patients with Coronary Artery Disease

- 1) An ACE inhibitor or ARB is recommended for most patients with hypertension and coronary artery disease (Grade A).
- 2) For patients with stable angina, beta-blockers are preferred as initial therapy (Grade B). CCBs may also be used (Grade B).
- 3) Short-acting nifedipine should not be used (Grade D).
- 4) For patients with coronary artery disease, but without coexisting systolic heart failure, the combination of an ACE inhibitor and ARB is not recommended (Grade B).
- 5) In high-risk patients, when combination therapy is being used, choices should be individualized. The combination of an ACE inhibitor and a dihydropyridine CCB is preferable to an ACE inhibitor and a diuretic in selected patients (Grade A).

B) Recommendations for Patients with Hypertension Who Have Had a Recent Myocardial Infarction

- 1) Initial therapy should include both a beta-blocker and an ACE inhibitor (Grade A). An ARB can be used if the patient is intolerant of an ACE inhibitor (Grade A in patients with left ventricular systolic dysfunction).
- 2) CCBs may be used in postmyocardial infarction patients when beta blockers are contraindicated or not effective. Nondihydropyridine CCBs should not be used when there is heart failure, as evidenced by pulmonary congestion on examination or radiography (Grade D).

VII TREATMENT OF HYPERTENSION IN ASSOCIATION WITH HEART FAILURE

- 1) In patients with systolic dysfunction (EF <40%), ACE inhibitors (Grade A) and β -blockers (Grade A) are recommended for initial therapy. **Aldosterone antagonists (mineral corticoid receptor antagonists) may be added**

for patients with a recent cardiovascular hospitalization, acute myocardial infarction, elevated BNP or NT-proBNP level, or NYHA Class II to IV symptoms (Grade A). Careful monitoring for hyperkalemia is recommended when adding an aldosterone antagonist to ACE inhibitor or ARB. Other diuretics are recommended as additional therapy if needed (Grade B for thiazide diuretics for BP control, Grade D for loop diuretics for volume control). Beyond considerations of blood pressure control, doses of ACE inhibitors or ARBs should be titrated to those found to be effective in trials unless adverse effects become manifest (Grade B).

- 2) An ARB is recommended if ACE inhibitors are not tolerated (Grade A).
- 3) A combination of hydralazine and isosorbide dinitrate is recommended if ACE inhibitors and ARBs are contraindicated or not tolerated (Grade B).
- 4) For hypertensive patients whose blood pressure is not controlled, an ARB may be added to an ACE inhibitor and other antihypertensive drug treatment (Grade A). Careful monitoring should be used if combining an ACE inhibitor and an ARB due to potential adverse effects such as hypotension, hyperkalemia and worsening renal function (Grade C). Additional therapies may also include dihydropyridine CCBs (Grade C).

VIII TREATMENT OF HYPERTENSION IN ASSOCIATION WITH STROKE

A Blood Pressure Management in Acute Stroke (Onset to 72 Hours)

- 1) For patients with ischemic stroke not eligible for thrombolytic therapy, treatment of hypertension in the setting of acute ischemic stroke or TIA should not be routinely undertaken [Grade D]. Extreme blood pressure elevation (e.g. systolic >220 mmHg or diastolic >120 mmHg) may be treated to reduce the blood pressure by approximately 15 percent [Grade D], and not more than 25%, over the first 24h with gradual reduction thereafter [Grade D]. Avoid excessive lowering of blood pressure as this may exacerbate existing ischemia or may induce ischemia, particularly in the setting of intracranial arterial occlusion or extra cranial carotid or vertebral artery occlusion [Grade D]. Pharmacological agents and routes of administration should be chosen to avoid precipitous falls in blood pressure (Grade D).
- 2) For patients with ischemic stroke eligible for thrombolytic therapy, very high blood pressure (>185/110mmHg)

should be treated concurrently in patients receiving thrombolytic therapy for acute ischemic stroke to reduce the risk of secondary intracranial hemorrhage. [Grade B]

B Blood Pressure Management After Acute Stroke

- 1) Strong consideration should be given to the initiation of antihypertensive therapy after the acute phase of a stroke or transient ischemic attack (Grade A).
- 2) Following the acute phase of a stroke, blood pressure lowering treatment is recommended to a target of consistently lower than 140/90 mmHg (Grade C).
- 3) Treatment with an ACE inhibitor/diuretic combination is preferred (Grade B).
- 4) For patients with stroke, the combination of an ACE inhibitor and ARB is not recommended (Grade B).

IX TREATMENT OF HYPERTENSION IN ASSOCIATION WITH LEFT VENTRICULAR HYPERTROPHY

- 1) Hypertensive patients with left ventricular hypertrophy should be treated with antihypertensive therapy to lower the rate of subsequent cardiovascular events (Grade C).
- 2) The choice of initial therapy can be influenced by the presence of left ventricular hypertrophy (Grade D). Initial therapy can be drug treatment using ACE inhibitors, ARBs, long-acting CCBs or thiazide diuretics. Direct arterial vasodilators such as hydralazine or minoxidil should not be used.

X TREATMENT OF HYPERTENSION IN ASSOCIATION WITH NON-DIABETIC CHRONIC KIDNEY DISEASE

- 1) For patients with non-diabetic chronic kidney disease, target BP is < 140/90 mmHg (Grade B).
- 2) For patients with hypertension and proteinuric chronic kidney disease (urinary protein > 500 mg/24hr or albumin to creatinine ratio [ACR] > 30 mg/mmol), initial therapy should be an ACE inhibitor (Grade A) or an ARB if there is intolerance to ACE inhibitors (Grade B).
- 3) Thiazide diuretics are recommended as additive antihypertensive therapy (Grade D). For patients with chronic kidney disease and volume overload, loop diuretics are an alternative (Grade D).
- 4) In most cases, combination therapy with other antihypertensive agents may be needed to reach target blood pressures (Grade D).

- 5) The combination of an ACE inhibitor and ARB is not recommended for patients with nonproteinuric chronic kidney disease (Grade B).

XI TREATMENT OF HYPERTENSION IN ASSOCIATION WITH RENOVASCULAR DISEASE

- 1) Renovascular hypertension should be treated in the same manner as hypertension without compelling indications, except for caution in the use of ACE inhibitors or ARBs due to the risk of acute renal failure in bilateral disease or unilateral disease with a solitary kidney (Grade D).
- 2) Close follow-up and early intervention (angioplasty and stenting or surgery) should be considered for patients with uncontrolled hypertension despite therapy with three or more drugs, deteriorating kidney function, bilateral atherosclerotic renal artery lesions (or tight atherosclerotic stenosis in a single kidney) or recurrent episodes of flash pulmonary edema (Grade D).

XII TREATMENT OF HYPERTENSION IN ASSOCIATION WITH DIABETES MELLITUS

- 1) Persons with diabetes mellitus should be treated to attain systolic blood pressures of less than 130 mmHg (Grade C) and diastolic blood pressures of less than 80 mmHg (Grade A). (These target blood pressure levels are the same as the blood pressure treatment thresholds.) Combination therapy using two first-line agents may also be considered as initial treatment of hypertension (Grade B) if systolic blood pressure is 20 mmHg above target or if diastolic blood pressure is 10 mmHg above target. However, caution should be exercised in patients in whom a substantial fall in blood pressure is more likely or poorly tolerated (e.g. elderly patients and patients with autonomic neuropathy).
- 2) For persons with cardiovascular or kidney disease, including microalbuminuria or with cardiovascular risk factors in addition to diabetes and hypertension, an ACE inhibitor or an ARB is recommended as initial therapy (Grade A).
- 3) For persons with diabetes and hypertension not included in the above recommendation, appropriate choices include (in alphabetical order): ACE inhibitors (Grade A), angiotensin receptor blockers (Grade B), dihydropyridine CCBs (Grade A) and thiazide/thiazide-like diuretics (Grade A).
- 4) If target blood pressures are not achieved with standard-dose monotherapy, additional antihypertensive therapy

should be used. For persons in whom combination therapy with an ACE inhibitor is being considered, a dihydropyridine CCB is preferable to hydrochlorothiazide (Grade A).

XIII ADHERENCE STRATEGIES FOR PATIENTS

- 1) Adherence to an antihypertensive prescription can be improved by a multipronged approach (Table 4).

XIV TREATMENT OF SECONDARY HYPERTENSION DUE TO ENDOCRINE CAUSES

- 1) Treatment of hyperaldosteronism and pheochromocytoma are outlined in Online Table 1 and Online Table 2.

THERAPY TABLES

TABLE 1: Dietary Approaches to Stop Hypertension (DASH) Diet

Food Group	Daily Serving	Examples and Notes
Whole Grains	6-8	Whole wheat breads, cereal, oatmeal, rice, pasta, quinoa, barley, low fat, low sodium crackers
Vegetables	4-5	Dark green and orange fresh or frozen vegetables, tomatoes, leafy greens, carrots, peas, squash, spinach, peppers, broccoli, sweet potatoes
Fruits	4-5	Have fruit more often than juice: Apples, apricots, bananas, grapes, oranges, grapefruit, melons, peaches, berries, mango
Low-fat or fat-free milk foods or alternatives	2-3	Skim, 1% milk, fortified soy beverage or yogurt, 6-18% MF, cheese
Meats, poultry, fish	< 6 ounces	Select only lean meats. Choose fish like char, herring, mackerel, salmon, sardines and trout. Trim away fats. Broil, roast or boil. No frying. Remove skin from poultry. Low sodium, low fat deli meats
Nuts, seeds, legumes	4-5/week	Almonds, peanuts, walnuts, sunflower seeds, soybeans, lentils, chick peas, dried peas and beans, tofu
Fats and oils	2-3 tsp.	Soft margarines, mayonnaise, vegetable oil (olive, corn, canola, or safflower), salad dressing
Sweets	≤ 5 Tbsp./ Week	Sugar, jelly, jam, hard candy, syrups, sorbet, chocolate

(DASH eating plan available at: http://www.nhlbi.nih.gov/health/public/heart/hbp/dash/new_dash.pdf)

TABLE 2: Possible Reasons for Poor Response to Antihypertensive Therapy

Non-compliance	<ul style="list-style-type: none">• Dietary• Medication
Associated Conditions	<ul style="list-style-type: none">• Obesity• Cigarette smoking• Excessive alcohol consumption• Sleep apnea• Chronic pain
Drug Interactions	<ul style="list-style-type: none">• Nonsteroidal anti-inflammatory drugs (including cyclo-oxygenase-2 inhibitors)• Oral contraceptives• Corticosteroids and anabolic steroids• Sympathomimetics and decongestants• Cocaine• Amphetamines• Erythropoietin• Cyclosporine, tacrolimus• Licorice• Over the counter dietary supplements (e.g., ephedra, ma huang, bitter orange)• Monoamine oxidase inhibitors, certain selective serotonin reuptake inhibitors and serotonin-norepinephrine reuptake inhibitors
Suboptimal Treatment Regimens	<ul style="list-style-type: none">• Dosage too low• Inappropriate combinations of antihypertensive agents
Volume Overload	<ul style="list-style-type: none">• Excessive salt intake• Renal sodium retention (pseudotolerance)
Secondary Hypertension	<ul style="list-style-type: none">• Renal insufficiency• Renovascular disease• Primary hyperaldosteronism• Thyroid disease• Pheochromocytoma and other rare endocrine causes• Obstructive sleep apnea

Note that causes of 'pseudo-resistance' (such as white coat hypertension or pseudo-hypertension in the elderly) should be ruled out first.

Adapted from McAlister et al.

TABLE 3: Cardiovascular Risk Factors for Consideration of Statin Therapy in Non-dyslipidemic Patients With Hypertension

Risk Factor

- Male sex
- Age \geq 55
- Left ventricular hypertrophy
- Other ECG abnormalities:
 - Left bundle branch block, left ventricular strain pattern, abnormal Q-waves or ST-T changes compatible with ischemic heart disease
- Peripheral arterial disease
- Previous stroke or transient ischemic attack
- Microalbuminuria or proteinuria
- Diabetes mellitus
- Smoking
- Family history of premature cardiovascular disease
- Total cholesterol to high-density lipoprotein ratio \geq 6

If hypertensive patients have three or more of these risk factors, statins should be considered.

TABLE 4: Strategies to Improve Patient Adherence*

- 1) Assist your patient to adhere by:
 - i) Tailoring pill-taking to fit patients' daily habits (Grade D);
 - ii) Simplifying medication regimens to once-daily dosing (Grade D);
 - iii) Replacing multiple pill antihypertensive combinations with single pill combinations (Grade C);
 - iv) Utilizing unit-of-use packaging (of several medications to be taken together) (Grade D); and
 - v) Adherence to an antihypertensive prescription can be improved by a multidisciplinary team approach (Grade B).
- 2) Assist your patient in getting more involved in their treatment by:
 - vi) Encouraging greater patient responsibility/autonomy in monitoring their blood pressure and adjusting their prescriptions (Grade C); and
 - vii) Educating patients and patients' families about their disease and treatment regimens (Grade C)

- 3) Improve your management in the office and beyond by:
 - viii) Assessing adherence to pharmacological and non-pharmacological therapy at every visit (Grade D);
 - ix) Encouraging adherence with therapy by out-of-office contact (either by phone or mail), particularly during the first three months of therapy (Grade D);
 - x) Coordinating with pharmacists and work-site healthcare givers to improve monitoring of adherence with pharmacological and lifestyle modification prescriptions (Grade D).
 - xi) Utilizing electronic medication compliance aids (Grade D).

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ONLINE TABLE 1: Treatment Recommendations for Patients with Hyperaldosteronism*

- 1) Treatment of confirmed unilateral aldosterone-producing adenoma (APA) is surgical removal by laparoscopic adrenalectomy.
- 2) Patients should be treated for eight to 10 weeks before surgery to correct metabolic abnormalities and to control blood pressure.
- 3) For primary aldosteronism patients with adrenal hyperplasia, bilateral adenoma or increased risk of perioperative complications, treatment is medical.
- 4) Medical treatment should be initiated with spironolactone 25 mg - 400 mg per day (usual doses are 100 mg - 200 mg). For those intolerant to spironolactone, amiloride 10 - 20 mg per day is an alternative. Addition of thiazide diuretics, beta-blockers and/or calcium channel blockers may be useful to control blood pressure.
- 5) Because many APA patients will remain hypertensive following the surgical removal of an APA, these patients should be followed and, if necessary, treated according to the usual guidelines for nonendocrine hypertension.

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ONLINE TABLE 2:

Treatment Recommendations for Patients with Pheochromocytoma*

- 1) Alpha-blockers (prazosin, doxazosin, terazosin and phenoxybenzamine) should be used as first-line agents in suspected pheochromocytoma. Alpha methyl dopa or clonidine may also be used.
- 2) Treatment of benign pheochromocytoma should be surgical resection. The following issues should be considered:
 - i) Until surgery is performed, the use of beta-blockers should be avoided, unless there are arrhythmias present and adequate alpha blockade has been achieved;
 - ii) Surgical resection should be carefully planned in advance with involvement of a team of surgical, medical, intensivist and anesthesia consultants who have experience in the management of patients with pheochromocytoma;
 - iii) Laparoscopic surgery should be considered before open surgery for resection of pheo-chromocytoma except for very large tumours;
 - iv) Administration for 10 to 14 days of phenoxybenzamine (10 - 20 mg bid-tid), prazosin (1-3 mg bid-tid), terazosin (2-10 mg bid) or doxazosin (2-4 mg bid-tid) is indicated for patients with severe paroxysmal or sustained hypertension;
 - v) The tyrosine hydroxylase inhibitor metyrosine (0.25-1g four times daily) should also be considered;
 - vi) Immediately prior to surgery, administration of intravenous fluids should be considered to ensure adequate volume expansion in order to avoid shock after tumour removal;
 - vii) For hypertensive crises before / during surgery, phentolamine hydrochloride should be readily available and if necessary, administered intravenously; and
 - viii) Intravenous propranolol should be employed for treatment of arrhythmias.

- 3) For patients with pheochromocytoma diagnosed during early pregnancy, if a decision is made to terminate the pregnancy, this should be carried out under alpha and beta-blockade (as above), followed immediately by tumor resection. In late pregnancy, alpha and beta-blockade, followed by elective cesarean section and immediate tumor resection are recommended.
- 4) For patients with inoperable or metastatic malignant pheochromocytoma, blood pressure control and adrenergic symptoms may be controlled with alpha-adrenergic blockade (phenoxybenzamine, prazosin, doxazosin, terazosin) plus beta-blockade and/or tyrosine hydroxylase inhibition with metyrosine. A combination of cyclophosphamide, vincristine, and dacarbazine may be used for chemotherapy or metastatic pheochromocytoma. Treatment with high dose I131 – MIBG induces only a moderate response, but may help control of blood pressure.

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TABLE 5: Considerations in the Individualization of Antihypertensive Therapy†**

		Notes and/or Cautions	
Initial therapy		Second-line therapy	
HYPERTENSION WITHOUT OTHER COMPELLING INDICATIONS FOR A SPECIFIC AGENT			
Diastolic hypertension with or without systolic hypertension (target <140/90 mmHg)	Thiazide diuretics, beta-blockers, ACE inhibitors, ARBs, or long acting calcium channel blockers (consider ASA and statins in selected patients). Consider initiating therapy with a combination of first-line drugs if the blood pressure is ≥ 20 mmHg systolic or ≥ 10 mmHg diastolic above target.	Combinations of first-line drugs	Not recommended for monotherapy. Alpha blockers, Beta-blockers in those ≥ 60 years of age, ACE inhibitors in Blacks. Hypokalemia should be avoided in those prescribed diuretics monotherapy. ACE inhibitors and direct rennin inhibitors are potential teratogens, and caution is required if prescribing to women of child bearing potential. Combination of an ACE inhibitor with an ARB is not recommended.
Isolated systolic hypertension without other compelling indications (target BP for age <80 is <140/90 mmHg; for age ≥ 80 the target SBP is <150 mmHg).	Thiazide diuretics, ARBs or long acting dihydropyridine calcium channel blockers.	Combinations of first-line drugs	Same as diastolic hypertension with or without systolic hypertension
DIABETES MELLITUS — TARGET BLOOD PRESSURE < 130/80 mmHg			
Diabetes mellitus with microalbuminuria*, renal disease, cardiovascular disease or additional cardiovascular risk factors	ACE inhibitors or ARBs	Addition of dihydropyridine CCB is preferred over thiazide.	A loop diuretic could be considered in hypertensive CDK patients with extracellular fluid overload.
Diabetes mellitus not included in the above category	ACE inhibitors, ARBs, dihydropyridine CCBs or thiazide diuretics	Combination of first-line drugs. If combination with ACE-inhibitor is being considered a dihydropyridine CCB is preferable to thiazide diuretic	Normal albumin to creatinine ratio [ACR] < 2.0 mg/mmol in men and < 2.8 mg/mmol in women

Notes and/or Cautions

Second-line therapy

Initial therapy

CARDIOVASCULAR DISEASE — TARGET BLOOD PRESSURE < 140/90 mmHg

Initial therapy	Second-line therapy	Notes and/or Cautions
Coronary artery disease	ACE inhibitors or ARBs (except in low-risk patients); beta-blockers for patients with stable angina	Avoid short-acting nifedipine. Combination of an ACE-inhibitor with an ARB is specifically not recommended.
Recent myocardial infarction	Beta-blockers and ACE inhibitors (ARBs if ACE inhibitor intolerant)	Non-dihydropyridine CCBs should not be used with concomitant-heart failure.
Heart failure	ACE inhibitors (ARBs if ACE inhibitor intolerant) and beta-blockers. Aldosterone antagonists (mineral corticoid receptor antagonists) may be added for patients with a recent cardiovascular hospitalization, acute myocardial infarction, elevated BNP or NT-proBNP level or NYHA Class II to IV symptoms.	Titrate doses of ACE inhibitors and ARBs to those used in clinical trials. Carefully monitor potassium and renal function if combining an ACE inhibitor, ARB and/or aldosterone antagonist.
Left ventricular hypertrophy	ACE inhibitor, ARB, long acting CCB or thiazide diuretics	Hydralazine and minoxidil can increase left ventricular hypertrophy
Past stroke or TIA	ACE inhibitor/diuretic combinations	Treatment of hypertension should not be routinely undertaken in acute stroke unless extreme BP elevation. Combination of an ACE inhibitor with an ARB is not recommended.

Initial therapy		Second-line therapy		Notes and/or Cautions
NON-DIABETIC CHRONIC KIDNEY DISEASE — TARGET BLOOD PRESSURE < 140/90 mmHg				
Nondiabetic chronic kidney disease with proteinuria [†]	ACE inhibitors (ARBs if ACE inhibitor intolerant) if there is proteinuria. Diuretics as additive therapy	Combinations of additional agents	Carefully monitor renal function and potassium for those on an ACE inhibitor or ARB. Combinations of an ACE-inhibitor and ARB are not recommended in patients without proteinuria.	
Renovascular disease	Does not affect initial treatment recommendations	Combinations of additional agents	Avoid ACE inhibitors or ARBs if bilateral renal artery stenosis or unilateral disease with solitary kidney	
OTHER CONDITIONS — TARGET BLOOD PRESSURE < 140/90 mmHg				
Peripheral arterial disease	Does not affect initial treatment recommendations	Combinations of additional agents	Avoid beta-blockers with severe disease	
Dyslipidemia	Does not affect initial treatment recommendations	Combinations of additional agents		
Overall vascular protection	Statin therapy for patients with 3 or more cardiovascular risk factors or atherosclerotic disease Low dose ASA in patients with controlled blood pressure		Caution should be exercised with the ASA recommendation if blood pressure is not controlled.	

* Albuminuria is defined as persistent albumin to creatinine ratio [ACR] >2.0 mg/mmol in men and >2.8 mg/mmol in women.

[†] Proteinuria is defined as urinary protein >500 mg/24hr or albumin to creatinine ratio [ACR] >30 mg/mmol.

ACE: Angiotensin-converting enzyme; **ARB:** Angiotensin receptor blocker; **ASA:** Acetylsalicylic acid; **CCB:** Calcium channel blocker; **NYHA:** New York Heart Association; **TIA:** Transient ischemic attack.

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The recommendations in this book are presented as a convenient reference tool for health care professionals. It is based on the 2013 Canadian Hypertension Education Program (CHEP), which is now part of one national hypertension organization – Hypertension Canada.

This presentation is designed as an abridged overview based on the more complete program recommendations. For more information, readers are invited to log onto www.hypertension.ca.

We hope this book proves a useful and practical addition to your diagnosis and treatment of hypertension. Please be reminded, however, that all therapeutic decisions are ultimately the responsibility of the attending physician.

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