

2009 CHEP Recommendations for the Management of Hypertension



Part 1: Diagnosis & Assessment

I ACCURATE MEASUREMENT OF BLOOD PRESSURE

- 1) The blood pressure (BP) of all adult patients should be assessed at all appropriate visits for determination of cardiovascular risk and monitoring of antihypertensive treatment by health care professionals who have been specifically trained to measure BP accurately (Grade D).
- 2) Use of standardized measurement techniques (Table 1) is recommended when assessing blood pressure (Grade D).

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

- 1) At visit 1, patients demonstrating features of a hypertensive urgency or emergency (Table 2) should be diagnosed as hypertensive and require immediate management (Grade D).
- 2) If systolic BP (SBP) is 140 mm Hg or greater and/or diastolic BP (DBP) is 90 mm Hg or greater a specific visit should be scheduled for the assessment of hypertension (Grade D). If BP is high-normal (SBP 130 - 139 mm Hg and/or DBP 85 - 89 mm Hg) annual follow up is recommended (Grade C).
- 3) At the initial visit for the assessment of hypertension, SBP is 140 mm Hg or greater and/or diastolic (DBP) blood pressure is 90 mm Hg or greater, 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).

* **bold typeface in the body text indicates a new or revised recommendation**

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- 4) At visit 2 for the assessment of hypertension, patients with macrovascular target organ damage, diabetes mellitus, or chronic kidney disease (CKD; GFR < 60 ml/min) can be diagnosed as hypertensive if SBP is 140 mm Hg or greater and/or DBP is 90 mm Hg or greater (Grade D).
- 5) At visit 2 for the assessment of hypertension, patients without macrovascular target organ damage, diabetes mellitus, and/or chronic kidney disease can be diagnosed as hypertensive if SBP is 180 mm Hg or greater and/or DBP is 110 mm Hg or greater (Grade D). Patients without macrovascular target organ damage, diabetes mellitus, or CKD but with lower blood pressure levels should undergo further evaluation using any of the three approaches outlined below:
 - i) Office BPs:
Using office BP measurements, patients can be diagnosed as hypertensive if the SBP is 160 mm Hg or higher or the DBP is 100 mm Hg or higher averaged across the first 3 visits, or if the SBP averages 140 mm Hg or higher or the DBP averages 90 mm Hg or higher averaged across five 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 mm Hg or higher or the DBP is 85 mm Hg or higher, or if the mean 24 hour SBP is 130 mm Hg or higher or the DBP is 80 mm Hg or higher (Grade C).
 - iii) Home BP Measurement:
Using home BP measurements (see Section VII), patients can be diagnosed as hypertensive if the average SBP is 135 mm Hg or higher or the DBP is 85 mm Hg or higher (Grade C). If the average home BP is lower than 135/85 mm Hg, it is advisable to perform 24 h ABPM to confirm the mean 24 h ABPM is lower than 130/80 mm Hg and the mean awake ABPM is lower than 135/85 mm Hg 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).

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- 8) Hypertensive patients receiving lifestyle modification advice alone (nonpharmacological treatment) should be followed up at three- to six-month intervals. Shorter intervals (one or two monthly) 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 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 those with 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 more accurately (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 C).

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

- 1) Routine laboratory tests 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 total cholesterol and high density lipoprotein cholesterol, low density lipoprotein cholesterol and triglycerides (Grade D); and
 - v) standard 12-lead electrocardiography (Grade C)
- 2) Assess urinary albumin excretion in patients with diabetes (Grade D).
- 3)
 - i) All treated hypertensive patients should be monitored according to the current Canadian Diabetes Association guidelines for a new appearance of diabetes (Grade B); and
 - ii) During the maintenance phase of hypertension management, tests (including those for electrolytes, creatinine, glucose 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 older than 55 years or younger than 30 years;
 - ii) the presence of an abdominal bruit;
 - iii) hypertension resistant to three or more drugs;

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- iv) a rise in serum creatinine level of 30% or more 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; and
 - 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 computed tomographic angiography (for those with normal renal function) (Grade B). Captopril-enhanced radioisotope renal scan is not recommended for those with CKD (GFR less than 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 (potassium level lower than 3.5 mmol/L);
 - ii) hypertensive patients with marked diuretic-induced hypokalemia (potassium level lower 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 (Table 6).
- 3) For patients with suspected hyperaldosteronism (on the basis of the screening test, Table 6 [iii]), a diagnosis of primary aldosteronism should be established by demonstrating

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inappropriate autonomous hypersecretion of aldosterone using at least one of the manoeuvres listed in Table 6 (iv). When the diagnosis is established, the abnormality should be localized using any of the tests described in Table 6 (v).

B) Pheochromocytoma Screening and Diagnosis

- 1) If pheochromocytoma is strongly suspected, the patient should be referred to a specialized hypertension center, particularly if biochemistry screening tests (Table 7) 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 180/110 mm Hg or higher) 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 disease (neurofibromatosis) or von Hippel-Lindau disease.
- 3) For patients with positive biochemical screening tests, localization of pheochromocytomas should employ magnetic resonance imaging (preferable), computed tomography (if MRI is unavailable), and/or iodine-131 metaiodobenzylguan (MIBG) scintigraphy (Grade C for each modality).

VII HOME MEASUREMENT OF BLOOD PRESSURE

- 1) Home BP readings can be used in the diagnosis of hypertension (Grade C).
- 2) The use of home BP monitoring on a regular basis should be considered for patients with hypertension, particularly those with:
 - i) diabetes mellitus (Grade D);

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- ii) chronic kidney disease (Grade C);
 - iii) suspected nonadherence (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 home monitoring, its presence should be confirmed with ABPM before making treatment decisions (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 mm Hg or higher or DBP values 85 mm Hg or higher should be considered to be elevated and associated with an increased overall mortality risk analogous to office SBP readings of 140 mm Hg or higher or DBP 90 mm Hg or higher (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).

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VIII AMBULATORY BLOOD PRESSURE MEASUREMENT

- 1) Ambulatory BP readings can be used in the diagnosis of hypertension (Grade C).
- 2) 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 antihypertensive therapy (Grade C);
 - ii) symptoms suggestive of hypotension (Grade C); or
 - iii) fluctuating office BP readings (Grade D).
- 3) Physicians should use only ABPM devices that have been validated independently using established protocols (Grade D).
- 4) Therapy adjustment should be considered in patients with 24 h ambulatory SBP of 130 mm Hg or higher and/or DBP of 80 mm Hg or higher and/or awake SBP of 135 mm Hg or higher and/or DBP of 85 mm Hg or higher (Grade D).
- 5) 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 BP 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).**

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DIAGNOSIS & ASSESSMENT TABLES

TABLE 1: Recommended Technique for Measuring Blood Pressure*

- i) Measurements should be taken with a sphygmomanometer known to be accurate. A recently calibrated aneroid or a validated and recently calibrated electronic device can be used (see text for further discussion). 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 antecubital fossa 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.

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- iv) Increase the pressure rapidly to 30 mm Hg 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 mm Hg per heart beat. A cuff deflation rate of 2 mm Hg 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 V Korotkoff)). Continue to auscultate at least 10 mm Hg below phase V to exclude a diastolic auscultatory gap. Record the blood pressure to the closest 2 mm Hg on the manometer (or 1 mm Hg 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.
- viii) If Korotkoff sounds persist as the level approaches 0 mm Hg, then the point of muffling of the sound is used (phase IV) to indicate the diastolic pressure.

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- ix) In the case of arrhythmia, additional readings may be required to estimate the average systolic and diastolic pressure. Isolated extra beats should be ignored. Note the rhythm and pulse rate.

- x) 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.

- xi) 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.

*** These are instructions for blood pressure measurement when using a sphygmomanometer and stethoscope; many steps may not apply when using automated devices. Reprinted with permission of the Canadian Hypertension Education Program**

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Table 2: Examples of Hypertensive Urgencies and Emergencies *

Asymptomatic diastolic BP \geq 130 mm Hg

Hypertensive encephalopathy

Acute aortic dissection

Acute left ventricular failure

Acute myocardial ischemia

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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

Chronic kidney disease

Hypertensive nephropathy (GFR < 60 ml/min/1.73 m²)

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Albuminuria

Peripheral artery disease

Intermittent claudication

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

A 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 \geq 55 years

Male sex

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

Modifiable

Sedentary lifestyle

Poor dietary habits

Abdominal obesity

Dysglycemia

Smoking

Dyslipidemia

Stress

Target organ damage

Left ventricular hypertrophy

Microalbuminuria or proteinuria

Chronic kidney disease (glomerular filtration rate < 60 ml/min/1.73 m²)

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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 or sympathomimetic decongestants
- Calcineurin inhibitors (cyclosporin, tacrolimus)
- Erythropoietin and analogues
- Monoamine oxidase inhibitors (MAOIs)
- Midodrine

Other substances:

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

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Table 6: 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/s)	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/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.) Manoeuvres to demonstrate autonomous hypersecretion 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

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for three days with primary aldosteronism defined as failure to suppress plasma aldosterone to less than 240 pmol/L)

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/PRA ratio greater than 1400 pmol/L/ng/ml/hr with a plasma aldosterone greater than 440 pmol/L

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

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sampling should be conducted in centres with experience in performing this diagnostic technique.

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Table 7: Pheochromocytoma: Screening and diagnosis *

Biochemical screening tests for pheochromocytomas:

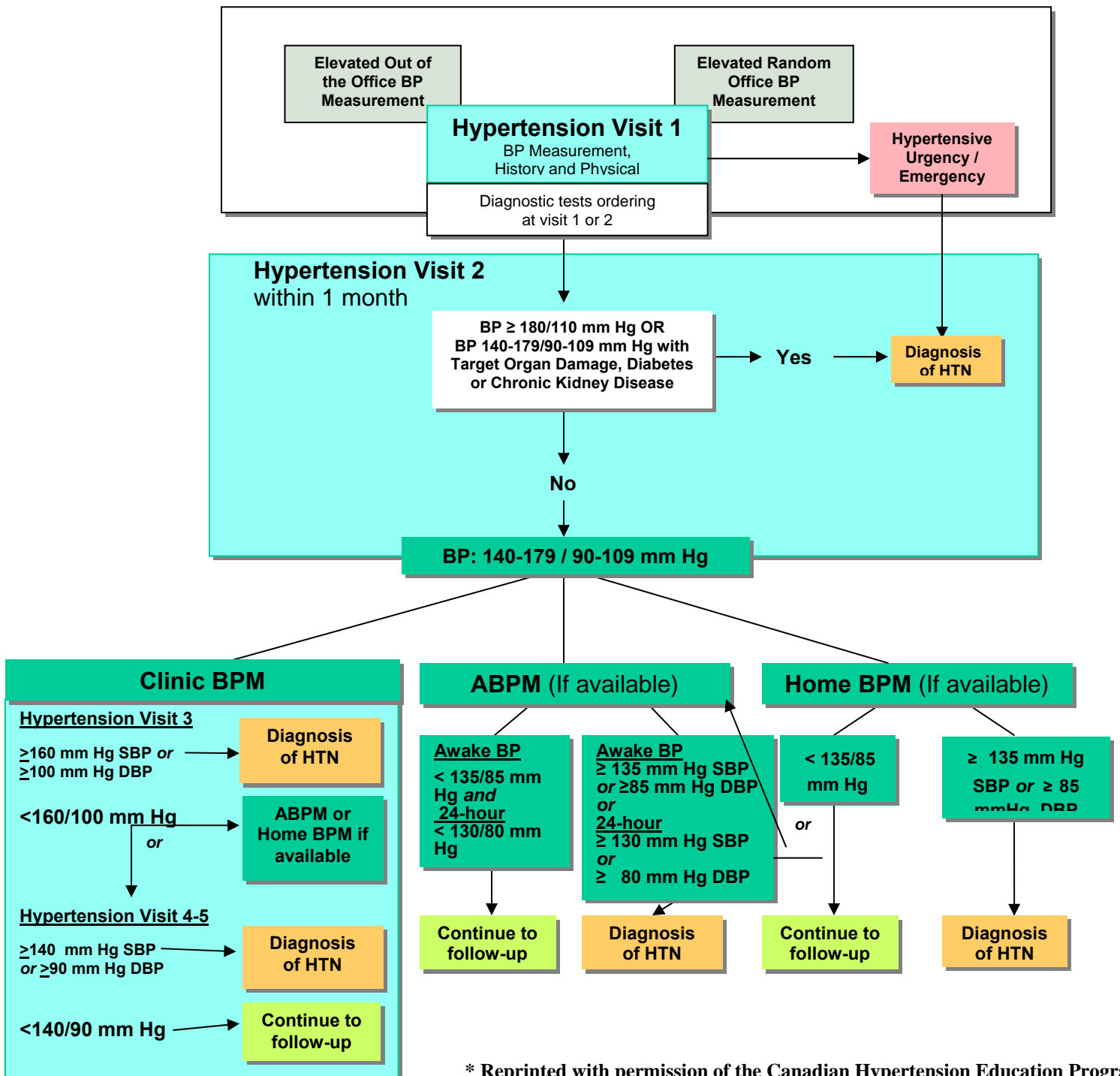
- a) To screen for pheochromocytomas, 24 h urinary total metanephrines (sensitivity 95%) and urinary metanephrine-to-creatinine ratio (sensitivity 100%) should be assessed. Plasma catecholamines and, where available, plasma metanephrines may also be considered if clinical suspicion is high, particularly 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 2,000 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

Part 2: Therapy

I LIFESTYLE MANAGEMENT

A) Physical Exercise

- 1) For nonhypertensive individuals (to reduce the possibility of becoming hypertensive) or for hypertensive patients (to reduce blood pressure) prescribe the accumulation of 30 min to 60 min of moderate intensity dynamic exercise (such as walking, jogging, cycling or swimming) 4 -7 days per week, in addition to the routine activities of daily living (Grade D). Higher intensities of exercise are no more effective (Grade D).

B) Weight Reduction

- 1) Height, weight, and waist circumference (WC) should be measured and body mass index (BMI) calculated for all adults (Grade D).
- 2) Maintenance of a healthy body weight (BMI 18.5 kg/m² to 24.9 kg/m² and waist circumference of less than 102 cm for men and less than 88 cm for women; **waist circumference less than 90 cm for South Asian men and less than 80 cm for South Asian women**) is recommended for nonhypertensive 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 use 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 2 drinks or less per day, and consumption should not exceed 14 standard drinks per week for men and 9 standard drinks per week for women (Grade B).

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(Note: one standard drink is considered 13.6 g or 17.2 ml of ethanol, or approximately 44 mL of 80 proof (40%) spirits, 355 mL of 5% beer or 148 mL 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 fiber, whole grains and protein from plant sources that is reduced in saturated fat and cholesterol (Dietary Approaches to Stop Hypertension [DASH] diet; Table 2) (Grade B).

E) Salt Intake

- 1) For prevention of hypertension, in addition to a well-balanced diet, a dietary sodium intake of less than 100 mmol (2,300 mg) per day is recommended (Grade B).
- 2) In hypertensive patients, dietary sodium intake should be limited to 65 mmol to 100 mmol (1495 mg to 2300 mg) per day (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 used (Grade B).

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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 mm Hg or higher (Grade A) or average systolic blood pressures of 160 mm Hg or higher (Grade A) in patients without macrovascular target organ damage or other cardiovascular risk factors (see Tables 3 and 4 from accompanying CHEP Diagnosis paper).
- 2) Antihypertensive therapy should be strongly considered if diastolic blood pressure readings average 90 mm Hg 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 mm Hg or higher in the presence of macrovascular target organ damage (Grade C for 140 mm Hg to 160 mm Hg; Grade A for higher than 160 mm Hg).
- 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 \pm Systolic Hypertension

- 1) Initial therapy should be monotherapy with a thiazide diuretic (Grade A); a beta-blocker (in patients younger than 60 years of age, 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 an ACE inhibitor, ARB or beta-blocker (Grade B for the combination of thiazide diuretic with 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 beta-blocker (Grade D). **The combination of an ACE inhibitor and ARB is not recommended (Grade A).**

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- 3) Combination therapy using two first-line agents may also be considered as initial treatment of hypertension if systolic blood pressure is 20 mmHg above target or if diastolic blood pressure is 10 mmHg above target (Grade C). However, caution should be exercised in patients in whom a substantial fall in blood pressure is more likely or more poorly tolerated (e.g. elderly patients) from initial combination therapy.
- 4) If blood pressure is still not controlled with a combination of 2 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 3) 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 aged 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 comorbid 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 choices (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 3) should be considered (Grade D).
- 5) Alpha-blockers are not recommended as first-line agents for uncomplicated isolated systolic hypertension (Grade A), and beta-blockers are not recommended as first-line therapy for isolated systolic hypertension in patients aged 60 years or older (Grade A). However, both agents may be used in patients with certain comorbid conditions or in combination therapy.

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

- 1) Statin therapy is recommended in hypertensive patients with 3 or more cardiovascular risk factors as defined in Table 4 (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 ASA 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 lower than 140 mm Hg (Grade C). The diastolic blood pressure treatment goal is lower than 90 mm Hg (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 is recommended for most patients with hypertension and documented coronary artery disease (Grade A).
- 2) For patients with stable angina, beta-blockers are preferred as initial therapy (Grade B). Long-acting CCBs may also be used (Grade B).
- 3) Short-acting nifedipine should not be used (Grade D).
- 4) **For patients with CAD, but without coexisting systolic heart failure, the combination of an ACE inhibitor and ARB is not recommended (Grade B).**

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B) Recommendations for Patients with Hypertension Who Have Had a Recent ST-elevation Myocardial Infarction or Non-ST Segment Elevation Myocardial Infarction

- 1) Initial therapy should include both a beta-blocker and an ACE inhibitor (Grade A). An ARB may be used if the patient is intolerant of an ACE inhibitor (Grade A in patients with left ventricular systolic dysfunction).
- 2) Long-acting 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 radiograph (Grade D).

VII TREATMENT OF HYPERTENSION IN ASSOCIATION WITH HEART FAILURE

- 1) In patients with systolic dysfunction, ACE inhibitors (Grade A) and beta blockers (Grade A) are recommended for initial therapy. Aldosterone antagonists (Grade B) are also recommended for patients with NYHA Class III or IV symptoms of heart failure or following MI. Other diuretics are recommended as additional therapy if needed (Grade B for thiazide diuretics for blood pressure 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 are 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 with heart failure 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 long-acting dihydropyridine CCBs (Grade C).

VIII TREATMENT OF HYPERTENSION IN ASSOCIATION WITH CEREBROVASCULAR DISEASE

- 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).

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- 2) Caution is indicated in deciding whether to lower blood pressure in the acute stroke situation; pharmacological agents and routes of administration should be chosen to avoid precipitous falls in blood pressure (Grade D).
- 3) Following the acute phase of a stroke, patients should have their blood pressure chronically controlled to a target of lower than 140/90 mm Hg (Grade C).
- 4) Treatment with an ACE inhibitor plus diuretic combination is preferred (Grade B).
- 5) **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 blood pressure is lower than 130/80 mm Hg (Grade C).
- 2) For patients with hypertension and proteinuric chronic kidney disease (urinary protein greater than 500 mg/24 h or albumin to creatinine ratio [ACR] greater than 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).

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- 4) **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 using 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 pressure lower than 130 mm Hg (Grade C) and diastolic blood pressure lower than 80 mm Hg (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 therapy of hypertension (Grade B) if the SBP is 20 mmHg above target or the DBP 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, patients with autonomic nephropathy).
- 2) For patients with diabetes and normal urinary albumin excretion (ACR lower than 2.0 mg/mmol in men and lower than 2.8 mg/mmol in women) and without chronic kidney disease, with blood pressure 130/80 mm Hg or higher despite lifestyle interventions, **any one of the following are recommended:** an ACE inhibitor (Grade A for patients 55 years or older, Grade B for patients younger than 55 years); ARB (Grade A for persons with left ventricular hypertrophy and age of 55 years or older, Grade B for persons without left ventricular hypertrophy irrespective of age); a dihydropyridine CCB (Grade A for patients 55 years of age or older, Grade B for patients younger than 55 years of age), or a **thiazide or a thiazide-like** diuretic (Grade A for patients 55 years of age or older, Grade B for patients younger than 55 years of age) is recommended, with special consideration should be given to an ACE inhibitor and ARB, given their additional renal benefits. If these drugs are contraindicated or cannot be tolerated, a cardioselective beta-blocker (Grade B) or nondihydropyridine CCB (Grade B) may be substituted. Additional

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antihypertensive drugs should be used if target blood pressure is not achieved with standard-dose monotherapy (Grade B). **The combination of an ACE inhibitor and ARB is not recommended in patients with diabetes and normal urinary albumin levels (Grade B).**

- 3) For patients with diabetes and albuminuria (persistent ACR greater than 2.0 mg/mmol in men and greater than 2.8 mg/mmol in women), an ACE inhibitor or an ARB is recommended as initial therapy (Grade A). If blood pressure remains 130/80 mm Hg or higher despite lifestyle interventions and the use of an ACE inhibitor or ARB, additional antihypertensive drugs should be used to obtain target blood pressure.
- 4) For patients with diabetes and a normal urinary albumin excretion rate (ACR lower than 2.0 mg/mmol in men and lower than 2.8 mg/mmol in women) with no chronic kidney disease and with isolated systolic hypertension, a long-acting dihydropyridine CCB (Grade C) is an alternative initial choice to an ACE inhibitor (Grade B), ARB (Grade B), or a **thiazide or a thiazide-like diuretic** (Grade C).
- 5) Alpha-blockers are not recommended as first-line agents for the treatment of hypertension in patients with diabetes (Grade A).

XIII CONCORDANCE STRATEGIES FOR PATIENTS

- 1) Adherence to an antihypertensive prescription can be improved by a multipronged approach, as outlined in Table 5.

XIV TREATMENT OF SECONDARY HYPERTENSION DUE TO ENDOCRINE CAUSES

- 1) Treatment of hyperaldosteronism and pheochromocytoma are outlined in Tables 6 and 7.

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Table 2: Dietary Approaches to Stop Hypertension (DASH) Diet

Food Group	Daily Serving	Examples and Notes
Grains	7-8/day	Whole wheat bread, oatmeal, popcorn
Vegetables	4-5/day	Tomatoes, potatoes, carrots, beans, peas, squash, spinach
Fruits	4-5/day	Apricots, bananas, grapes, oranges, grapefruit, melons
Low-fat or fat-free dairy foods	2-3/day	Fat-free (skim) or low-fat (1%) milk, fat-free or low-fat yogurt, fat-free or low-fat cheese
Meats, poultry, fish	2/day	Select only lean meats. Trim away fats. Broil, roast or boil; no frying. Remove skin from poultry.
Nuts, seeds, dry beans	4-5/week	Almonds, peanuts, walnuts, sunflower seeds, soybeans, lentils
Fats and oils	2-3/day	Soft margarines, low-fat mayonnaise, vegetable oil (olive, corn, canola, or safflower)
Sweets	5/week	Maple syrup, sugar, jelly, jam, hard candy, sorbet

(DASH eating plan available at:

http://www.nhlbi.nih.gov/health/public/heart/hbp/dash/new_dash.pdf)

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Table 3: Possible Reasons for Poor Response to Antihypertensive Therapy*

Non-compliance	Dietary Medication
Associated Conditions	Obesity Cigarette smoking Excessive alcohol consumption Sleep apnea Chronic pain and/or mental illness
Drug Interactions	Nonsteroidal anti-inflammatory drugs (including cyclo-oxy-genase-2 (COX-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)
Suboptimal Treatment Regimens	Dosage too low Inappropriate combinations of antihypertensive agents
Volume Overload	Excessive salt intake Renal sodium retention (pseudotolerance)
Secondary Hypertension	Renal insufficiency Renovascular disease Primary hyperaldosteronism Thyroid disease Pheochromocytoma and other rare endocrine causes

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 FA, Zarnke KB, Campbell NR, Feldman RD, Levine M, Mahon J, Grover SA, Lewanczuk R, Leenen F, Tobe S, Lebel M, Stone J, Schiffrin EL, Rabkin SW, Ogilvie RI, Larochelle P, Jones C, Honos G, Fodor G, Burgess E, Hamet P, Herman R, Irvine J, Culleton B, Wright JM; Canadian

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Hypertension Recommendations Working Group. The 2001 Canadian recommendations for the management of hypertension: Part two--Therapy. *Can J Cardiol.* 2002;18(6):625-41.)

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Table 4: Cardiovascular Risk Factors for Consideration of Statin Therapy in Non-dyslipidemic Patients With Hypertension[†]

Risk Factor

Male sex \geq 55 years

Age \geq 55 years

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 HDL cholesterol ratio \geq 6

[†] If hypertensive patients have 3 or more of these risk factors, statins should be considered. In addition, patients should be treated according to the most recent Canadian Lipid Recommendations.

(Derived from: Sever PS, Dahlof B, Poulter NR, Wedel H, Beevers G, Caulfield M, Collins R, Kjeldsen SE, Kristinsson A, McInnes GT, Mehlsen J, Nieminen M, O'Brien E, Ostergren J; ASCOT investigators. Prevention of coronary and stroke events with atorvastatin in hypertensive patients who have average or lower-than-average cholesterol concentrations, in the Anglo-Scandinavian Cardiac Outcomes Trial--Lipid Lowering Arm (ASCOT-LLA): a multicentre randomised controlled trial. *Lancet.* 2003;361(9364):1149-58.)

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Table 5: Strategies to Improve Patient Adherence*

-
- 1) Assist your patient to adhere
- i) Tailoring pill-taking to fit patients' daily habits
 - ii) Simplifying medication regimens to once-daily dosing
 - iii) Replacing 2 antihypertensive agents with a fixed dose combination (where available and appropriate), provided it is the same combination the patient is already taking
 - iv) Utilizing unit-of-use packaging (of several medications to be taken together)
 - v) Identify potential barriers to adherence
-
- 2) Assist your patient in getting more involved in their treatment
- vi) Encouraging greater patient responsibility/autonomy in monitoring their blood pressure and adjusting their prescriptions
 - vii) Educating patients and patients' families about their disease/treatment regimens
- 3) Improve your management in the office and beyond
- viii) Assessing adherence to pharmacological and non-pharmacological therapy at every visit
 - ix) Encouraging adherence with therapy by out of office contact (either by phone or mail), particularly over the first three months of therapy
 - x) Coordinating with work-site healthcare givers to improve monitoring of adherence with pharmacological and lifestyle modification prescriptions
 - xi) Utilizing electronic medication compliance aids
 - xii) **Adherence to an antihypertensive prescription can be improved by a multidisciplinary team approach**
-

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Table 6. 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 8 - 10 weeks prior to surgery, to correct metabolic abnormalities and to control blood pressure.
- 3) For primary aldosteronism patients with adrenal hyperplasia, bilateral adenoma, or increased risk of peri-operative complications, treatment is medical.
- 4) Medical treatment should be initiated with spironolactone 25-400 mg per day (usual doses are 100-200 mg). For those intolerant to spironolactone, amiloride 10-20 mg per day is an alternative. Addition of thiazide diuretics, beta-blockers and/or CCBs 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 non-endocrine hypertension.

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Table 7. Treatment Recommendations for Patients with Pheochromocytoma*

- 1) Alpha-blockers (prazosin, doxazosin, and phenoxybenzamine) should be used as first-line agents in suspected pheochromocytoma. Alpha methyldopa 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 pheochromocytoma 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) 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
 - 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) 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 8: Considerations in the Individualization of Antihypertensive Therapy*[†]

ACE angiotensin converting enzyme; TIA transient ischemic attack; ARB angiotensin receptor blocker

	<i>Initial therapy</i>	<i>Second-line therapy</i>	<i>Notes and/or Cautions</i>
HYPERTENSION WITHOUT OTHER COMPELLING INDICATIONS TARGET < 140/90 mmHg			
Diastolic+/- systolic hypertension	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	Beta-blockers are not recommended as initial therapy in those over 60 years of age. Hypokalemia should be avoided by using potassium-sparing agents in those who are prescribed diuretics as monotherapy. ACE inhibitors are not recommended in blacks. ACE inhibitors, ARBs 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 specifically not recommended.
Isolated systolic hypertension without other compelling indications	Thiazide diuretics, ARBs or long-acting dihydropyridine calcium channel blockers.	Combinations of first-line drugs	Same as diastolic+/- systolic hypertension
DIABETES MELLITUS TARGET < 130/80 mmHg			
Diabetes mellitus with nephropathy	ACE inhibitors or ARBs	Addition of thiazide diuretics, cardioselective beta-blockers, long-acting calcium channel blockers	If the serum creatinine level is $>150 \mu\text{mol/L}$, a loop diuretic should be used as a replacement for low-dose thiazide diuretics if volume control is required
Diabetes mellitus without nephropathy	ACE inhibitors, ARBs, dihydropyridine CCBs or thiazide diuretics	Combination of first-line drugs or if first-line agents are not tolerated addition of cardioselective beta-blockers and/or long-acting non dihydropyridine calcium channel blockers	Normal albumin to creatinine ratio [ACR] $< 2.0 \text{ mg/mmol}$ in men and $< 2.8 \text{ mg/mmol}$ in women Combination of an ACE-inhibitor with an ARB is specifically not recommended.
CARDIOVASCULAR AND CEREBROVASCULAR DISEASE TARGET < 140/90 mmHg			
Angina	Beta-blockers; ACE inhibitors except in low risk patients	Long-acting calcium channel blockers	Avoid short-acting nifedipine. Combination of an ACE-inhibitor with an ARB is specifically not recommended.
Prior myocardial infarction	Beta-blockers and ACE inhibitors (ARBs if ACEI- intolerant)	Long-acting calcium channel blockers	Combination of an ACE-inhibitor with an ARB is specifically not recommended.
Heart failure	ACE inhibitors (ARBs if ACEI- intolerant) and beta-blockers. Spironolactone in patients with NYHA class III or IV symptoms.	ARB in addition to ACE inhibitor. Hydralazine/isosorbide dinitrate combination Thiazide or loop diuretics, are recommended as additive therapy	Titrate doses of ACEI and ARB to those used in clinical trials. Avoid nondihydropyridine calcium channel blockers (diltiazem, verapamil). Monitor potassium and renal function if combining an ACE inhibitor with ARB.
Left ventricular hypertrophy	Does not affect initial treatment recommendations	Combination of additional agents	Hydralazine and minoxidil can increase left ventricular hypertrophy.
Past cerebrovascular accident or TIA	ACE inhibitor/diuretic combinations	Combination of additional agents	This does not apply to acute stroke. Blood pressure reduction reduces recurrent cerebrovascular events in stable patients. Combination of an ACE-inhibitor with an ARB is specifically not recommended.

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NON DIABETIC CHRONIC KIDNEY DISEASE

Non diabetic chronic kidney disease with proteinuria
ACE inhibitors (ARBs if ACEI-intolerant) if there is proteinuria.
Diuretics as additive therapy

TARGET < 130/80 mmHg

Combinations of additional agents

Avoid ACE inhibitors or ARBs if bilateral renal artery stenosis or unilateral disease with solitary kidney. Patients placed on an ACE inhibitor or an ARB should have their serum creatinine and potassium carefully monitored. Combinations of an ACE-inhibitor and ARB is specifically not recommended in people with chronic kidney disease without proteinuria.

Renovascular disease
Does not affect initial treatment recommendations

Combinations of additional agents

Avoid ACE inhibitors or ARB if bilateral renal artery stenosis or unilateral disease with solitary kidney.

OTHER CONDITIONS

Peripheral arterial disease
Does not affect initial treatment recommendations

TARGET < 140/90 mmHg

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.

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† It is recommended that normotensive adults with established cardiovascular disease be treated with an ACE inhibitor. Normotensive adults who have had a stroke or TIA should be treated with an ACE inhibitor and a diuretic.

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