

Guidelines

The 2013 Canadian Hypertension Education Program Recommendations for Blood Pressure Measurement, Diagnosis, Assessment of Risk, Prevention, and Treatment of Hypertension

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See page 541 for disclosure information.

A version of the hypertension recommendations designed for patient and public education has been developed to assist health care practitioners managing hypertension. The summary is available electronically (go to <http://www.hypertension.ca> or <http://www.heartandstroke.ca>).

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ABSTRACT

We updated the evidence-based recommendations for the diagnosis, assessment, prevention, and treatment of hypertension in adults for 2013. This year's update includes 2 new recommendations. First, among nonhypertensive or stage 1 hypertensive individuals, the use of resistance or weight training exercise does not adversely influence blood pressure (BP) (Grade D). Thus, such patients need not avoid this type of exercise for fear of increasing BP. Second, and separately, for very elderly patients with isolated systolic hypertension (age 80 years or older), the target for systolic BP should be < 150 mm Hg (Grade C) rather than < 140 mm Hg as recommended for younger patients. We also discuss 2 additional topics at length (the pharmacological treatment of mild hypertension and the possibility of a diastolic J curve in hypertensive patients with coronary artery disease). In light of several methodological limitations, a recent systematic review of 4 trials in patients with stage 1 uncomplicated hypertension did not lead to changes in management recommendations. In addition, because of a lack of prospective randomized data assessing diastolic BP thresholds in patients with coronary artery disease and hypertension, no recommendation to set a selective diastolic cut point for such patients could be affirmed. However, both of these issues will be examined on an ongoing basis, in particular as new evidence emerges.

RÉSUMÉ

Nous avons mis à jour les recommandations fondées sur des données probantes de 2013 en matière de diagnostic, d'évaluation, de prévention et de traitement de l'hypertension chez les adultes. Cette mise à jour annuelle inclut 2 nouvelles recommandations. Premièrement, chez les individus non hypertendus ou les individus hypertendus de stade 1, la pratique de l'entraînement musculaire et de l'entraînement poids et haltères n'influencent pas défavorablement la pression artérielle (PA; cote D). Par conséquent, ces patients ne doivent pas éviter ce type d'exercice par crainte d'une élévation de la PA. Deuxièmement, et de manière distincte, chez les patients très âgés ayant une hypertension systolique isolée (80 ans et plus), la valeur cible de PA systolique recommandée devrait être < 150 mm Hg (cote C) plutôt que < 140 mm Hg comme chez les patients plus jeunes. Nous avons également discuté en détail de 2 autres sujets (du traitement pharmacologique de l'hypertension légère et de la possibilité d'une courbe J de la pression diastolique chez les patients hypertendus ayant une maladie coronarienne). Après avoir considéré plusieurs limites méthodologiques, une revue systématique récente de 4 essais chez des patients ayant une hypertension non compliquée de stade 1 n'a pas mené à des changements dans les recommandations de prise en charge. De plus, en raison d'un manque de données aléatoires prospectives évaluant les seuils de PA diastolique chez les patients ayant une maladie coronarienne et une hypertension, aucune recommandation pour établir une limite supérieure de la pression diastolique pour ces patients ne pourrait être affirmée. Cependant, ces deux problèmes seront examinés de façon continue, en particulier à mesure que de nouvelles données scientifiques verront le jour.

Executive Summary

Objective: To provide annually updated evidence-based recommendations for the prevention, diagnosis, assessment, and treatment of hypertension in adults for 2013.

Methods: A Cochrane Collaboration librarian conducted an independent MedLine search up to August 2012. To identify additional studies, reference lists were reviewed and experts were contacted. All relevant articles were reviewed and appraised independently by content and methodology experts using standardized grading algorithms. For pharmacologic interventions, evidence from randomized trials and systematic reviews of trials was preferred and changes in cardiovascular morbidity and mortality, and total mortality, were the primary outcomes of interest. For health behaviour management, blood pressure (BP) lowering was accepted as a primary outcome. In patients with chronic kidney disease (CKD), progressive renal impairment was accepted as a clinically relevant primary outcome. All recommendations were graded according to the strength of the supporting evidence, and newly proposed recommendations or changes to existing recommendations were discussed at a 1-day consensus conference. Proposed recommendations accepted at this consensus conference were subsequently voted on by the 62-member Canadian Hypertension Education Program (CHEP) Recommendations Task Force. Recommendations that received at least 80% task force approval were accepted as final.

Recommendations

Diagnosis and assessment

Recommendations for BP measurement, criteria for hypertension diagnosis and follow-up, diagnosis of white coat hypertension, assessment of global cardiovascular risk, diagnostic testing, diagnosis of renovascular and endocrine causes of hypertension, ambulatory monitoring, and the use of echocardiography in hypertensive individuals are unchanged.

Prevention and treatment

New recommendations include: (1) for nonhypertensive 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); and (2) in the very elderly (age 80 years or older), the target for systolic BP (SBP) should be < 150 mm Hg (Grade C). Recommendations on health behaviour interventions to prevent and treat hypertension, indications for pharmacologic management of hypertension, treatment thresholds and targets, choice of therapy for adults with hypertension and without compelling indications for other agents, isolated systolic hypertension, cerebrovascular disease, proteinuric nondiabetic CKD, ischemic heart disease, left ventricular hypertrophy, diabetes, and global vascular protection have not changed. Treatment for pheochromocytoma, primary hyperaldosteronism, and strategies to improve antihypertensive medication adherence are unchanged.

Updates

CHEP will continue to update recommendations annually.

Introduction

Hypertension affects 19.7% of the Canadian adult population and remains one of the most important modifiable risk factors for cardiovascular disease globally.¹⁻³ The prevalence of hypertension in Canada continues to increase and is predicted to reach 7,500,000 people in 2012/2013 with more than 1000 people newly diagnosed with hypertension every day.⁴ The CHEP recommendations process is funded by Hypertension Canada and provides annually updated, evidence-based recommendations for health care providers, with the ultimate goal of improving hypertension prevention, detection, and management in Canada.

These recommendations focus on adult care and are predominantly targeted toward primary care providers. For issues related to the diagnosis and evaluation of high BP in children and adolescents, the reader is referred to separate guidelines.⁵ A version of the hypertension recommendations designed for patient and public education has been developed to assist health care practitioners managing hypertension and is freely available at: <http://www.hypertension.ca>.

Although individual antihypertensive agents might be mentioned when discussing evidence, the reader should presume the existence of a class effect unless otherwise stated. In addition, these recommendations are intended as a guide for health care practitioners and should not replace sound clinical judgement. They also do not take economic considerations into account. Health care providers are also advised to consider patient preferences when applying these recommendations to their patients.

This document outlines all recommendations endorsed by the CHEP Recommendations Task Force for 2013 and discusses the evidence and rationale for those recommendations that are new or updated. A more detailed discussion of previous changes to the Canadian recommendations is available in previous publications.⁶⁻¹⁸ A full set of tables can be found within the 2012 iteration of these guidelines,¹⁸ and online in supplementary format with the 2013 iteration. Topics discussed in 2013 include the SBP treatment target in the very elderly, the effect of resistance training on BP, the treatment of Stage 1 uncomplicated hypertension, and diastolic treatment thresholds in patients with ischemic heart disease.¹⁹⁻²¹

Methods

The CHEP Recommendations Task Force is a multidisciplinary panel comprised of 2 co-chairs and 23 subgroups. Subgroup members, considered content experts in their fields, were responsible for reviewing annual search results and, if indicated, drafting new recommendations or proposing changes to old recommendations (see [Supplemental Appendix S1](#) for the current CHEP membership list). An independent central review committee of methodology experts who had no industry affiliations separately reviewed, graded, and refined proposed recommendations, which were then presented at a 1-day consensus conference in Toronto. Members of the Canadian Task Force on Preventive Health Care, Canadian Diabetes Association Guidelines Committee, Canadian Society of Nephrology, Canadian Stroke Network, and the Canadian Cardiovascular Harmonized National Guideline Endeavour Initiative also collaborated with CHEP subgroup members to ensure harmonization of recommendations between organizations. Existing CHEP recommendations are annually updated and relevant emerging hypertension issues

identified by CHEP members and the target population (health care providers) are reviewed.

A systematic literature search was performed by a Cochrane Collaboration librarian in MedLine/PubMed using text words and MeSH headings. Search terms included hypertension [MeSH], hypertens*[ti, ab], and blood pressure; these were combined with topic-specific terms to generate search results for each subgroup to review. The search is current to August 2012. Bibliographies of identified articles were also manually searched (details of search strategies and retrieved articles are available upon request). Randomized controlled trials and systematic reviews of randomized trials were reviewed for treatment recommendations and cross-sectional and cohort studies were reviewed for assessing diagnosis and prognosis.

Studies that included relevant outcomes were selected for further review. Cardiovascular morbidity and mortality and total mortality outcomes were prioritized. For health behaviour recommendations, BP was considered an acceptable surrogate and, in patients with CKD, progressive renal impairment was considered to be a clinically important outcome. Study characteristics and study quality were assessed using prespecified, standardized algorithms developed by CHEP²² for critical appraisal of randomized controlled trials and cohort studies. Recommendations were graded according to the strength of their underlying evidence (for details, see Supplemental Table S1), ranging from Grade A (strongest evidence, based on high-quality randomized clinical trials) to Grade D (weakest evidence, based on low power, imprecise studies or expert opinion alone).

After the consensus meeting, proposed recommendations were finalized and submitted to all 62 voting members of the CHEP Evidence-Based Recommendations Task Force for approval. Members with potential conflicts of interest recused themselves from voting on specific recommendations (a list of conflicts can be found in Supplemental Appendix S2). Recommendations receiving more than 70% approval were passed. This year, both newly proposed recommendations received at least 80% approval. The recommendations process is in accord with the Appraisal of Guidelines for Research and Evaluation (AGREE) II guidelines and has been externally reviewed.²³

The 2013 CHEP Diagnosis and Assessment Recommendations

I. Accurate measurement of BP

Recommendations

1. Health care professionals who have been specifically trained to measure 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 (Supplemental Table S2) is recommended when assessing BP (Grade D).
3. Automated office BP measurement (OBPM) can be used in the assessment of office BP (Grade D).
4. When used in proper conditions, automated office SBP of ≥ 135 mm Hg or diastolic BP (DBP) of ≥ 85 mm Hg should be considered analogous to mean awake ambulatory SBP of ≥ 135 mm Hg and DBP of ≥ 85 mm Hg, respectively (Grade D).

Background. There are no changes to these recommendations for 2013.

II. Criteria for diagnosis of hypertension and recommendations for follow-up (Fig. 1)

Recommendations

1. At initial presentation, patients demonstrating features of a hypertensive urgency or emergency (Supplemental Table S3) should be diagnosed as hypertensive and require immediate management (Grade D).
2. If SBP is ≥ 140 mm Hg and/or DBP is ≥ 90 mm Hg, 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, if SBP is ≥ 140 and/or DBP is ≥ 90 mm Hg, more than 2 additional readings should be taken during the same visit using a validated device and according to the recommended procedure for accurate BP determination (Supplemental Table S2). The first reading should be discarded and the latter 2 readings averaged. A history and physical examination should be performed and, if clinically indicated, diagnostic tests to search for target organ damage (Supplemental Table S4) and associated cardiovascular risk factors (Supplemental Table S5) should be arranged within 2 visits. Exogenous factors that can induce or aggravate hypertension should be assessed and removed if possible (Supplemental Table S6). Visit 2 should be scheduled within 1 month (Grade D).
4. At visit 2 for the assessment of hypertension, patients with macrovascular target organ damage, diabetes mellitus, or CKD (glomerular filtration rate < 60 mL per minute per 1.73 m²) can be diagnosed as hypertensive if SBP is ≥ 140 mm Hg and/or DBP is ≥ 90 mm Hg (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 mm Hg and/or the DBP is ≥ 110 mm Hg (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 3 approaches outlined next:
 - i. **OBPM:** Using manual OBPM, patients can be diagnosed as hypertensive if the SBP is ≥ 160 mm Hg or the DBP is ≥ 100 mm Hg averaged across the first 3 visits, or if the SBP averages ≥ 140 mm Hg or the DBP averages ≥ 90 mm Hg averaged across 5 visits (Grade D).
 - ii. **Ambulatory BP measurement (ABPM):** Using ABPM (see Recommendations in section VIII. ABPM), patients can be diagnosed as hypertensive if the mean awake SBP is ≥ 135 mm Hg or the DBP is ≥ 85 mm Hg or if the mean 24-hour SBP is ≥ 130 mm Hg or the DBP is ≥ 80 mm Hg (Grade C).
 - iii. **Home BP monitoring (HBPM):** Using HBPM (see Recommendations in section VII. HBPM), patients can be diagnosed as hypertensive if the average SBP is ≥ 135 mm Hg or the DBP is ≥ 85 mm Hg (Grade C). If the average home BP is $< 135/85$ mm Hg, it is advisable to

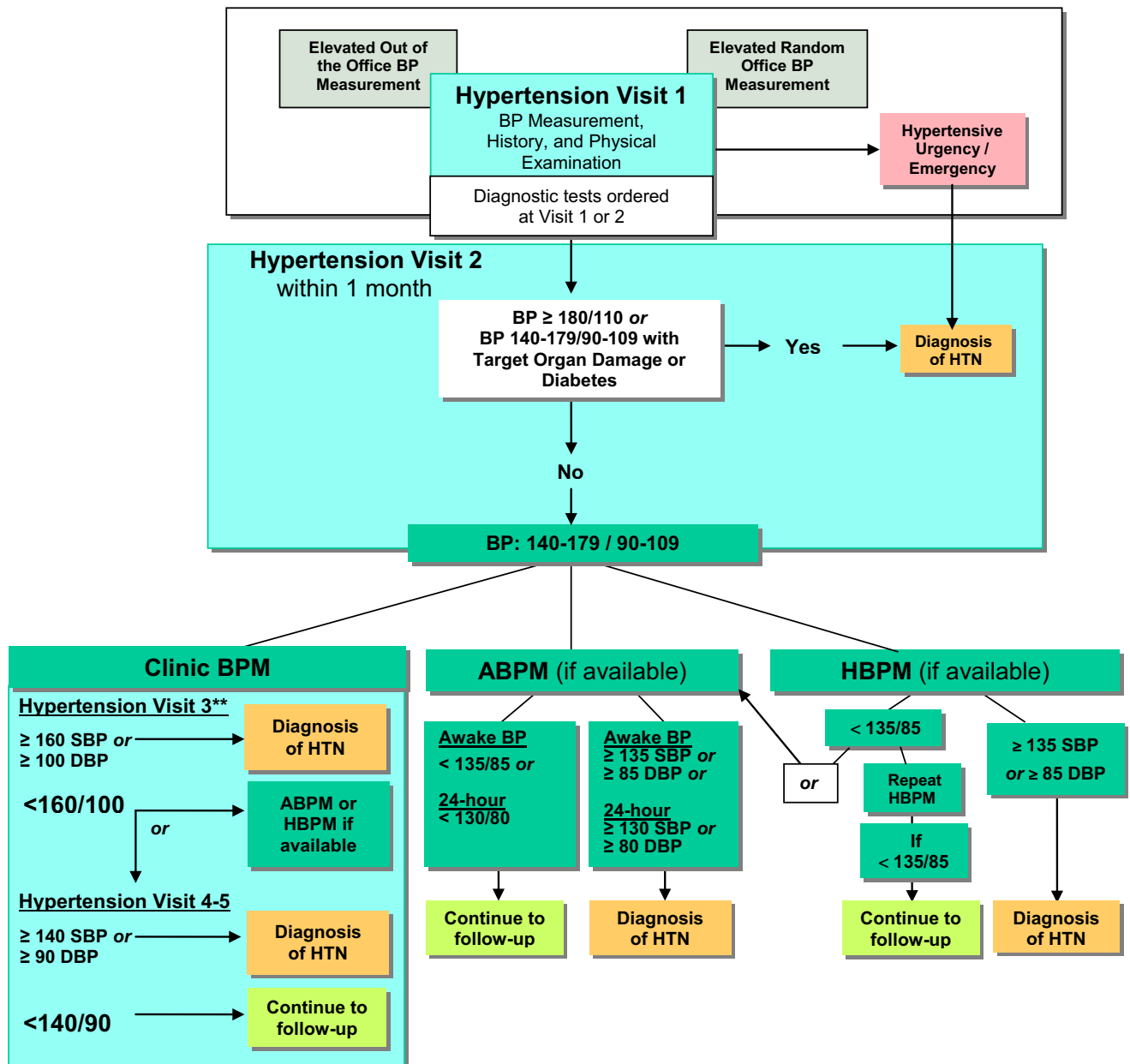


Figure 1. The expedited assessment and diagnosis of patients with hypertension: focus on validated technologies for BP assessment. **Thresholds refer to BP values averaged across the corresponding number of visits and not just the most recent office visit. ABPM, ambulatory BP measurement; BP, blood pressure (mm Hg); DBP, diastolic BP (mm Hg); HBPM, home BP measurement; HTN, hypertension; OBPM, office BP measurement; SBP, systolic BP (mm Hg). Reprinted with permission from the Canadian Hypertension Education Program.

either repeat home monitoring to confirm the home BP is $< 135/85$ mm Hg or perform 24-hour ABPM to confirm that the mean 24-hour ABPM is $< 130/80$ mm Hg and the mean awake ABPM is $< 135/85$ 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 in sections V and VI) (Grade D).
7. If at the last diagnostic visit the patient is not diagnosed as 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 3- to 6-month intervals. Shorter intervals (every 1 or 2 months) are needed for patients with higher BPs (Grade D).
9. Patients taking antihypertensive drugs should be seen monthly or every 2 months, depending on the level of BP, until readings on 2 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). When the target BP has been reached, patients should be seen at 3- to 6-month intervals (grade D).

Background. There are no changes to these recommendations for 2013.

III. Assessment of overall cardiovascular risk in hypertensive patients

Recommendations

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).

Background. Risk calculators are freely available at: www.myhealthcheckup.com (www.monbilansante.com). The Systematic Cerebrovascular and Coronary Risk Evaluation (SCORE) risk calculation was updated using Canadian data and is now available at <http://www.score-canada.ca>. There are no changes to these recommendations for 2013.

IV. Routine and optional laboratory tests for the investigation of patients with hypertension

Recommendations

1. Routine laboratory tests that should be performed for the investigation of all patients with hypertension include the following:
 - 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 lipoprotein cholesterol, and triglycerides (Grade D);
 - v. 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 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).

Background. There are no changes to these recommendations for 2013.

V. Assessment for renovascular hypertension

Recommendations

1. Patients presenting with ≥ 2 of the clinical clues listed next, suggesting renovascular hypertension, should be investigated (Grade D):

- i. Sudden onset or worsening of hypertension and age > 55 or < 30 years;
- ii. Presence of an abdominal bruit;
- iii. Hypertension resistant to ≥ 3 drugs;
- iv. Rise in serum creatinine level $\geq 30\%$ associated with use of an angiotensin-converting enzyme (ACE) inhibitor or angiotensin-receptor blocker (ARB);
- v. Other atherosclerotic vascular disease, particularly in patients who smoke or have dyslipidemia;
- vi. Recurrent pulmonary edema associated with hypertensive surges. 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 computer tomography angiography (for those with normal renal function) (Grade B). Captopril-enhanced radioisotope renal scan is not recommended for those with CKD (glomerular filtration rate < 60 mL per minute per 1.73 m²) (Grade D).

Background. There are no changes to these recommendations for 2013.

VI. Endocrine hypertension

Recommendations

A. Hyperaldosteronism: screening and diagnosis

1. Screening for hyperaldosteronism should be considered for the following patients (Grade D):
 - i. Hypertensive patients with spontaneous hypokalemia ($K^+ < 3.5$ mmol/L);
 - ii. Hypertensive patients with marked diuretic-induced hypokalemia ($K^+ < 3.0$ mmol/L);
 - iii. Patients with hypertension refractory to treatment with ≥ 3 drugs;
 - iv. Hypertensive patients found to have an incidental adrenal adenoma.
2. Screening for hyperaldosteronism should include assessment of plasma aldosterone and plasma renin activity (Supplemental Table S7).
3. For patients with suspected hyperaldosteronism (on the basis of the screening test, Supplemental Table S7, Item iii), a diagnosis of primary aldosteronism should be established by demonstrating inappropriate autonomous hypersecretion of aldosterone using at least 1 of the manoeuvres listed in Supplemental Table S7, Item iv. When the diagnosis is established, the abnormality should be localized using any of the tests described in Supplemental Table S7, Item v.

B. Pheochromocytoma: screening and diagnosis

1. If pheochromocytoma is strongly suspected, the patient should be referred to a specialized hypertension centre, particularly if biochemical screening tests (Supplemental Table S8) 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 mm Hg) sustained hypertension refractory to usual antihypertensive therapy;
- ii. Patients with hypertension and multiple symptoms suggestive of catecholamine excess (eg, headaches, palpitations, sweating, panic attacks, and pallor);
- iii. Patients with hypertension triggered by β -blockers, monoamine oxidase inhibitors, micturition, or changes in abdominal pressure;
- iv. Patients with incidentally discovered adrenal mass and patients with hypertension and multiple endocrine neoplasia 2A or 2B, von Recklinghausen's neurofibromatosis, or von Hippel-Lindau disease;
- v. For patients with positive biochemical screening tests, localization of pheochromocytomas should involve the use of magnetic resonance imaging (preferable), computed tomography (if magnetic resonance imaging is unavailable), and/or iodine I-131 meta-iodobenzylguanidine scintigraphy (Grade C for each modality).

Background. There are no changes to these recommendations for 2013.

VII. HBPM

Recommendations

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. CKD (Grade C);
 - iii. Suspected nonadherence (Grade D);
 - iv. Demonstrated white coat effect (Grade C);
 - 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 in this section) or ABPM before treatment decisions are made (Grade D).
4. Patients should be advised to purchase and use only HBPM devices that are appropriate for the individual and 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 HBPM (Grade D).
5. Home SBP values \geq 135 mm Hg or DBP values \geq 85 mm Hg should be considered elevated and associated with an increased overall mortality risk analogous to office SBP readings of \geq 140 mm Hg or DBP \geq 90 mm Hg (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. HBPM for assessing white coat hypertension or sustained hypertension should be based on duplicate measures, morning and evening, for an initial 7-day period. First-day home BP values should not be considered (Grade D).

Background. There are no changes to these recommendations for 2013.

VIII. ABPM

Recommendations

1. ABPM 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 antihypertensive therapy (Grade C);
 - ii. Symptoms suggestive of hypotension (Grade C);
 - 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 24-hour ambulatory SBP of \geq 130 mm Hg or DBP of \geq 80 mm Hg or a mean awake SBP of \geq 135 mm Hg or DBP of \geq 85 mm Hg (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 on ABPM (Grade C) because a decrease in nocturnal BP of $<$ 10% is associated with increased risk of cardiovascular events.

Background. There are no changes to these recommendations for 2013.

IX. Role of echocardiography

Recommendations

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, and 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).

Background. There are no changes to these recommendations for 2013.

The CHEP 2013 Prevention and Treatment Recommendations

I. Health behaviour management

Recommendations

A. Physical exercise

1. For nonhypertensive 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) (**new recommendation**). For nonhypertensive individuals (to reduce the possibility of becoming hypertensive) or for hypertensive patients (to reduce their BP), prescribe the accumulation of 30-60 minutes of moderate intensity dynamic exercise (eg, 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 not more effective (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 18.5-24.9, and waist circumference < 102 cm for men and < 88 cm for women) is recommended for nonhypertensive individuals to prevent hypertension (Grade C) and for hypertensive patients to reduce BP (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 BP, alcohol consumption should be in accordance with Canadian low-risk drinking guidelines in normotensive and hypertensive individuals. Healthy adults should limit alcohol consumption to ≤ 2 drinks per day, and consumption should not exceed 14 standard drinks per week for men and 9 standard drinks per week for women (Grade B). (Note: 1 standard drink is considered to be equivalent of 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, 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] diet²⁴⁻²⁷; Supplemental Table S9) (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 aged ≤ 50 years; 1300 mg (57 mmol) per day for age 51-70 years; and 1200 mg (52 mmol) per day for age > 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 might be contributing to BP 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).

Background. Because of an acute increase in BP and potential use of the Valsalva manoeuvre during weight training, there have been concerns that this form of exercise could adversely increase BP levels, leading to an increased risk of hemorrhagic stroke or subarachnoid hemorrhage. A meta-analysis sought to clarify the effects of resistance training on BP.²¹ The results of 28 randomized controlled trials involving 33 study groups were pooled (1012 participants in total). Most trials examined dynamic resistance training (30 study groups), largely with the use of weight or resistance machines (27 study groups). Twenty-two of the trials involved supervised exercise. Many trials were not of high quality; for example, one-third did not report blinding of outcome assessment.

In individuals with a baseline BP of $\leq 139/89$ mm Hg (derived from 28 study arms), reductions in systolic (mean change -3.9 mm Hg; 95% confidence interval [CI], -6.4 to -1.2) and diastolic (mean change -3.9 mm Hg; 95% CI, -5.6 to -2.2) BP were observed. In subjects with hypertension, statistically nonsignificant reductions in mean systolic and DBP occurred (-1.7 mm Hg systolic; 95% CI, -5.5 to $+2.0$; and -1.1 mm Hg diastolic; 95% CI, -3.1 to $+0.91$). Maximum baseline systolic and diastolic values were 154 and 95 mm Hg, respectively, and no serious adverse events were reported.

Overall, this meta-analysis might have been too underpowered to discern significant reductions in BP in hypertensive patients. However, the absence of adverse effects provides reassurance regarding the safety of resistance training in hypertensive individuals. Considering that resistance training is associated with additional benefits on cardiometabolic risk-factor levels, the Task Force recommends this type of exercise need not be avoided for fear of adversely affecting BP levels.

II. Indications for drug therapy for adults with hypertension without compelling indications for specific agents

Recommendations

1. Antihypertensive therapy should be prescribed for average DBP measurements of ≥ 100 mm Hg (Grade A) or

- average SBP measurements of ≥ 160 mm Hg (Grade A) in patients without macrovascular target organ damage or other cardiovascular risk factors.
2. Antihypertensive therapy should be strongly considered if DBP readings average ≥ 90 mm Hg in the presence of macrovascular target organ damage or other independent cardiovascular risk factors (Grade A).
 3. Antihypertensive therapy should be strongly considered if SBP readings average ≥ 140 mm Hg in the presence of macrovascular target organ damage (Grade C for 140-160 mm Hg; Grade A for > 160 mm Hg).
 4. Antihypertensive therapy should be considered in all patients meeting indications 1-3 in this section, regardless of age (Grade B). Caution should be exercised in elderly patients who are frail.

Background. There are no changes to these recommendations for 2013. The Task Force reviewed a recently published Cochrane meta-analysis of 4 placebo-controlled randomized trials (8912 subjects) testing pharmacotherapy in patients with uncomplicated, stage 1 hypertension (BP 140-159/90-99 mm Hg).²⁸ This review was primarily based on individual patient data from the **Individual Data Analysis of Antihypertensive (INDANA) intervention trials database** and reported no statistically significant reduction in either overall mortality (1.7% for active treatment vs 2.0% for placebo; relative risk, 0.85; 95% CI, 0.63-1.15) or stroke (0.3% vs 0.6%; relative risk, 0.51; 95% CI, 0.24-1.08). However, the analysis was underpowered (only 167 total mortality events) and dominated by 1 study. In addition, important nonplacebo controlled trial data exist which examine this question. Notably, a 5-year pragmatic randomized trial comparing an intensive antihypertensive treatment program with usual care found a reduction in total mortality (5.9% with active treatment vs 7.4% for usual care; $P < 0.01$) in the subgroup of 7825 patients with DBP levels between 90 and 104 mm Hg.²⁹ Relative risk reductions were similar across BP strata (90-94, 95-99, and 100-104 mm Hg).

With respect to the treatment of stage 1 hypertension, 2 points deserve emphasis. First, nonpharmacological management should be instituted in all patients and, if successful, can potentially normalize BP levels without the need for drug therapy. Second, the decision to initiate pharmacological treatment and the timing of initiation should be guided by individual global cardiovascular risk assessment. In low risk patients, including those without other cardiovascular risk factors or target organ damage, an extended interval of non-pharmacological management alone, with appropriate monitoring of BP levels, can be used.

III. Choice of therapy for adults with hypertension without compelling indications for specific agents

Recommendations

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

1. Initial therapy should be monotherapy with a thiazide diuretic (Grade A), a β -blocker (in patients younger than 60 years; Grade B), an ACE inhibitor (in nonblack patients; Grade B), a long-acting calcium channel blocker (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 agents alone (Grade C).
2. Additional antihypertensive drugs should be used if target BP 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: ACE inhibitor, ARB, or β -blocker (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 non-dihydropyridine CCB and a β -blocker (Grade D). The combination of an ACE inhibitor and an ARB is not recommended (Grade A).
 3. Combination therapy using 2 first-line agents might also be considered as initial treatment of hypertension (Grade C) if SBP is 20 mm Hg above target or if DBP is 10 mm Hg above target. However, caution should be exercised in patients in whom a substantial fall in BP from initial combination therapy is more likely to occur or in whom it would be poorly tolerated (eg, elderly patients).
 4. If BP 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 ([Supplemental Table S10](#)) should be considered (Grade D).
 6. α -Blockers are not recommended as first-line agents for uncomplicated hypertension (Grade A); β -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 comorbid conditions or in combination therapy.

B. Recommendations for individuals with isolated systolic hypertension

1. In the very elderly (age 80 years and older), the target for SBP should be < 150 mm Hg (Grade C) (**new recommendation**).
2. 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).
3. Additional antihypertensive drugs should be used if target BP levels are not achieved with standard-dose monotherapy (Grade B). Add-on drugs should be chosen from first-line options (Grade D).
4. If BP is still not controlled with a combination of 2 or more first-line agents, or there are adverse effects, other classes of drugs (such as α -blockers, ACE inhibitors, centrally acting agents, or non-dihydropyridine CCBs) may be added or substituted (Grade D).
5. Possible reasons for poor response to therapy ([Supplemental Table S10](#)) should be considered (Grade D).

6. α -Blockers are not recommended as first-line agents for uncomplicated isolated systolic hypertension (Grade A); and β -blockers are not recommended as first-line therapy for isolated systolic hypertension in patients aged ≥ 60 years (Grade A). However, both agents may be used in patients with certain comorbid conditions or in combination therapy.

Background. This year, the Task Force reappraised the SBP treatment target in the very elderly (age ≥ 80 years), in whom the isolated systolic form of hypertension predominates. This reappraisal included review of a 1670-patient meta-analysis of placebo-controlled randomized trials that reported reductions in stroke, major cardiovascular events, and heart failure with anti-hypertensive drug treatment.³⁰ However, a trend toward increased overall and cardiovascular mortality was also noted in this meta-analysis. Subsequent to the meta-analysis, the Hypertension in the Very Elderly Trial (HYVET) was performed. HYVET enrolled 3845 subjects aged 80 years or older with SBP ≥ 160 mm Hg (baseline BP 173/91 mm Hg). The initial treatment was sustained release indapamide 1.5 mg per day or placebo. The ACE inhibitor perindopril (2 or 4 mg), or matching placebo, was added as necessary to achieve the target BP of 150/80 mm Hg. Patients were followed for the primary outcome of fatal or nonfatal stroke, and a number of secondary outcomes including all-cause mortality and cardiovascular mortality.

BP was reduced to 144/77 mm Hg in the active treatment group and was 15.0/6.1 mm Hg lower than the placebo group. The HYVET data safety and monitoring board stopped the trial at the second interim analysis (median follow-up of 1.8 years) because significantly lower rates of the primary outcome and all-cause mortality were found in the group receiving active treatment. In the final analysis, fatal or nonfatal stroke occurred in 1.2% of the subjects receiving active treatment and 1.8% in those receiving placebo (hazard ratio [HR], 0.70; 95% CI, 0.49-1.01). Statistically significant reductions in stroke mortality (0.7% vs 1.1%; HR, 0.61; 95% CI, 0.38-0.99) and all-cause mortality (4.7% vs 6.0%; HR, 0.79; 95% CI, 0.65-0.95) were observed. Of note, fewer serious adverse events were reported in the active treatment group.

Some methodological limitations of HYVET were noted. The a priori stopping rule significance level for the primary end point was not followed and between the interim and final analyses, statistical significance for the primary end point crossed the 0.05 threshold. Furthermore, most of the secondary outcome results (eg, the reductions in fatal stroke and all cardiovascular deaths) are no longer significant if the issue of multiple statistical testing is taken into account. Finally, the trial enrolled a relatively healthy sample of very elderly patients; thus, caution and close follow-up are warranted when generalizing to frailer patients.

IV. Global vascular protection therapy for adults with hypertension without compelling indications for specific agents

Recommendations

1. Statin therapy is recommended in hypertensive patients with 3 or more cardiovascular risk factors as defined in Supplemental Table S11 (Grade A in patients > 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 > 50 years). Caution should be exercised if BP is not controlled (Grade C).

Background. Regarding statin therapy, there are no changes to these recommendations for 2013. For further guidance in the management of patients with dyslipidemia, readers are referred to the 2012 Canadian Cardiovascular Society/Canadian guidelines for the diagnosis and treatment of dyslipidemia and prevention of cardiovascular disease in the adult.³¹ In view of recent evidence on the efficacy of low-dose aspirin for primary prevention, an in-depth review of this complex topic is planned for 2014.³²

V. Goal of therapy for adults with hypertension without compelling indications for specific agents

Recommendations

1. The SBP treatment goal is a pressure level of < 140 mm Hg (Grade C). The DBP treatment goal is a pressure level of < 90 mm Hg (Grade A).

Background. There are no changes to these recommendations for 2013.

VI. Treatment of hypertension in association with ischemic heart disease

Recommendations

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, β -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 β -blocker and an ACE inhibitor (Grade A).
2. An ARB can be used if the patient is intolerant of an ACE inhibitor (Grade A in patients with left ventricular systolic dysfunction).
3. CCBs may be used in patients after myocardial infarction when β -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).

Background. This year, CHEP debated the issue of setting a minimum DBP threshold for hypertensive patients with coronary artery disease. Post hoc analyses of large clinical trials in patients with coronary artery disease suggest a possible J curve, in which BP lowering below a specific nadir (which varied between studies) was associated with an increased risk of coronary events (but not stroke).³³⁻³⁵ This is mirrored by evidence from some but not all cohort studies.³⁶⁻³⁸

The only clinical trial to test this hypothesis in a prospective randomized fashion is the **Hypertension Optimal Treatment (HOT)** trial.²⁰ In the HOT trial, 18,790 patients with diastolic hypertension were randomly allocated to 3 different DBP targets: ≤ 90 mm Hg, ≤ 85 mm Hg, or ≤ 80 mm Hg. During the trial, DBP was reduced by 20.3 mm Hg, 22.3 mm Hg, and 24.3 mm Hg, in these 3 target groups, respectively. Among the 3080 patients with coronary artery disease at baseline, the number of major cardiovascular events declined nonsignificantly in relation to target groups (77, 68, and 62 events in the target groups ≤ 90 mm Hg, ≤ 85 mm Hg, and ≤ 80 mm Hg, respectively). There was a statistically significant reduction in the risk of stroke (35, 30, and 20 events occurred in the 3 target groups; *P* for trend 0.046, with a relative risk reduction of 43% for the ≤ 80 mm Hg target group compared with the ≤ 90 mm Hg target group). It is important to note that the achieved DBP in patients with coronary artery disease randomized to the most intensive target averaged 81.1 mm Hg (SD, 5.0) after 6 months of follow-up, which implies that the HOT trial cannot fully evaluate the risk-benefit trade-off for lowering DBP below this range. In the final analysis, considering the lack of prospective randomized data adequately addressing this issue, CHEP decided not to enact a DBP threshold for patients with coronary artery disease, but will continue to monitor this issue on an ongoing basis.

VII. Treatment of hypertension in association with heart failure

Recommendations

1. In patients with systolic dysfunction (ejection fraction $< 40\%$), ACE inhibitors (Grade A) and β -blockers (Grade A) are recommended for initial therapy. Aldosterone antagonists (mineralocorticoid receptor antagonists) may be added for patients with a recent cardiovascular hospitalization, acute myocardial infarction, elevated B-type natriuretic peptide or N-terminal pro-B-type natriuretic peptide level, or New York Heart Association class II to IV symptoms (Grade A). Careful monitoring for hyperkalemia is recommended when adding an aldosterone antagonist to ACE inhibitor or ARB therapy. 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 BP 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 BP 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 because of potential adverse effects such as hypotension, hyperkalemia, and worsening renal function (Grade C). Additional therapies might also include dihydropyridine CCBs (Grade C).

Background. There are no changes to these recommendations for 2013.

VIII. Treatment of hypertension in association with stroke

Recommendations

A. BP 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 transient ischemic attack should not be routinely undertaken (Grade D). Extreme BP elevation (eg, SBP > 220 mm Hg or DBP > 120 mm Hg) may be treated to reduce the BP by approximately 15% (Grade D), and not more than 25%, over the first 24 hours with gradual reduction thereafter (Grade D). Avoid excessive lowering of BP because this might exacerbate existing ischemia or might induce ischemia, particularly in the setting of intracranial arterial occlusion or extracranial carotid or vertebral artery occlusion (Grade D). Pharmacological agents and routes of administration should be chosen to avoid precipitous falls in BP (Grade D).
2. For patients with ischemic stroke eligible for thrombolytic therapy, very high BP ($> 185/110$ mm Hg) should be treated concurrently in patients receiving thrombolytic therapy for acute ischemic stroke to reduce the risk of secondary intracranial hemorrhage (Grade B).

B. BP 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. After the acute phase of a stroke, BP-lowering treatment is recommended to a target of BP consistently $< 140/90$ mm Hg (Grade C).
3. Treatment with an ACE inhibitor and/or diuretic combination is preferred (Grade B).
4. For patients with stroke, the combination of an ACE inhibitor and ARB is not recommended (Grade B).

Background. There are no changes to these recommendations for 2013.

IX. Treatment of hypertension in association with left ventricular hypertrophy

Recommendations

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.

Background. There are no changes to these recommendations for 2013.

X. Treatment of hypertension in association with nondiabetic CKD

Recommendations

1. For patients with nondiabetic CKD, target BP is < 140/90 mm Hg (Grade B).
2. For patients with hypertension and proteinuric CKD (urinary protein > 500 mg per 24 hours or albumin-to-creatinine ratio > 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 CKD and volume overload, loop diuretics are an alternative (Grade D).
4. In most cases, combination therapy with other antihypertensive agents might be needed to reach target BP levels (Grade D).
5. The combination of an ACE inhibitor and ARB is not recommended for patients with nonproteinuric CKD (Grade B).

Background. There are no changes to these recommendations for 2013.

XI. Treatment of hypertension in association with renovascular disease

Recommendations

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 because of 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 ≥ 3 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).

Background. There are no changes to these recommendations for 2013.

XII. Treatment of hypertension in association with diabetes mellitus

Recommendations

1. Persons with diabetes mellitus should be treated to attain SBPs of < 130 mm Hg (Grade C) and DBPs of < 80 mm

Hg (Grade A). (These target BP levels are the same as the BP treatment thresholds). Combination therapy using 2 first-line agents might also be considered as initial treatment of hypertension (Grade B) if SBP is 20 mm Hg above target or if DBP is 10 mm Hg above target. However, caution should be exercised in patients in whom a substantial fall in BP is more likely or poorly tolerated (eg, 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 previous recommendation, appropriate choices include (in alphabetical order): ACE inhibitors (Grade A), ARBs (Grade B), dihydropyridine CCBs (Grade A), and thiazide/thiazide-like diuretics (Grade A).
4. If target BP levels 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).

Background. There are no changes to these recommendations for 2013.

XIII. Adherence strategies for patients

Recommendations

1. Adherence to an antihypertensive prescription can be improved by a multipronged approach ([Supplemental Table S12](#)).

Background. There are no changes to these recommendations for 2013.

XIV. Treatment of secondary hypertension due to endocrine causes

Recommendations

1. Treatment of hyperaldosteronism and pheochromocytoma are outlined in [Supplemental Tables S13 and S14](#).

Background. There are no changes to these recommendations for 2013.

Implementation

The implementation task force conducts an extensive knowledge translation effort to enhance uptake and applicability of these recommendations. These efforts include knowledge exchange forums, targeted educational materials for primary care providers and patients, and freely available slide kits and summary documents of all recommendations on the Canadian Hypertension Society Web site (www.hypertension.ca). Documents are available in French and English, and some documents are translated into other languages. The CHEP outcomes task force conducts hypertension surveillance studies and reviews existing Canadian health surveys to identify gaps between current and best

Table 1. Considerations in the individualization of antihypertensive therapy

	Initial therapy	Second-line therapy	Notes and/or cautions
Hypertension without other compelling indications			
Diastolic hypertension with or without systolic hypertension (target BP < 140/90 mm Hg)	Thiazide diuretics, β -blockers, ACE inhibitors, ARBs, or long-acting CCBs (consider ASA and statins in selected patients). Consider initiating therapy with a combination of first-line drugs if the BP is \geq 20 mm Hg systolic or \geq 10 mm Hg diastolic above target	Combinations of first-line drugs	Not recommended for monotherapy: α -blockers, β -blockers in those \geq 60 years of age, ACE inhibitors in black individuals. Hypokalemia should be avoided in those prescribed diuretic monotherapy. ACE inhibitors, ARBs, and direct renin 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 mm Hg; for age \geq , the target SBP is < 150 mm Hg)	Thiazide diuretics, ARBs or long-acting dihydropyridine CCBs	Combinations of first-line drugs	Same as diastolic hypertension with or without systolic hypertension
Diabetes mellitus (target BP < 130/80 mm Hg)			
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 CKD patients with extracellular fluid volume 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 inhibitors is being considered, a dihydropyridine CCB is preferable to thiazide diuretic	Normal ACR < 2.0 mg/mmol in men and < 2.8 mg/mmol in women
Cardiovascular disease (target BP < 140/90 mm Hg)			
Coronary artery disease	ACE inhibitors or ARBs (except in low-risk patients); β -blockers for patients with stable angina	Long-acting CCBs. When combination therapy is being used for high risk patients, an ACE inhibitor/dihydropyridine CCB is preferred	Avoid short-acting nifedipine. Combination of an ACE-inhibitor with an ARB is specifically not recommended
Recent myocardial infarction	β -Blockers and ACE inhibitors (ARBs if ACE inhibitor-intolerant)	Long-acting CCBs if β -blocker contraindicated or not effective	Nondihydropyridine CCBs should not be used with concomitant heart failure
Heart failure	ACE inhibitors (ARBs if ACE inhibitor-intolerant) and β -blockers. Aldosterone antagonists (mineralocorticoid receptor antagonists) may be added for patients with a recent cardiovascular hospitalization, acute myocardial infarction, elevated BNP or N-terminal-proBNP level, or NYHA class II-IV symptoms	ACE inhibitor and ARB combined. Hydralazine/isosorbide dinitrate combination if ACE inhibitor and ARB contraindicated or not tolerated. Thiazide or loop diuretics are recommended as additive therapy. Dihydropyridine CCB	Titrate doses of ACE inhibitors and ARBs to those used in clinical trials. Carefully monitor potassium and renal function if combining any of ACE inhibitor, ARB, and/or aldosterone antagonist
Left ventricular hypertrophy	ACE inhibitor, ARB, long-acting CCB or thiazide diuretics	Combination of additional agents	Hydralazine and minoxidil should not be used
Past stroke or TIA	ACE inhibitor/diuretic combinations	Combination of additional agents	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
Nondiabetic CKD (target BP < 140/90 mm Hg)			
Nondiabetic CKD with proteinuria ¹	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 taking 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 ARB if bilateral renal artery stenosis or unilateral disease with solitary kidney

Table 1. Continued.

	Initial therapy	Second-line therapy	Notes and/or cautions
Other conditions (target BP < 140/90 mm Hg)			
Peripheral arterial disease	Does not affect initial treatment recommendations	Combinations of additional agents	Avoid β -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 BP	—	Caution should be exercised with the ASA recommendation if BP is not controlled

ACE, angiotensin-converting enzyme; ACR, albumin-to-creatinine ratio; ARB, angiotensin-receptor blocker; ASA, acetylsalicylic acid; BNP, B-type natriuretic peptide; BP, blood pressure; CCB, calcium channel blocker; CKD, chronic kidney disease; NYHA, New York Heart Association; TIA, transient ischemic attack.

*Albuminuria is defined as persistent ACR > 2.0 mg/mmol in men and > 2.8 mg/mmol in women.

†Proteinuria is defined as urinary protein > 500 mg per 24 hours or ACR > 30 mg/mmol.

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practices. The implementation task force also regularly receives feedback from end users to improve guideline processes and content. Although the number of primary care providers that directly receive CHEP materials on a regular basis has dramatically increased, CHEP is continuing to address the challenge of identifying and reaching all active primary care providers across Canada, through use of the hypertension.ca website, “Train the Trainer” teaching sessions, and wide dissemination of educational materials.

Future Directions

Table 1 contains a summary of pharmacological management recommendations for hypertension. The present report represents the 14th iteration of the annually updated CHEP recommendations for the management of hypertension. The Recommendations Task Force will continue to conduct systematic reviews of the clinical trial evidence and update these recommendations annually.

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Disclosures

Please see Supplemental Appendix S2 for a complete list of author disclosures.

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Supplementary Material

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