Notice

The guidelines in this book are presented as a convenient reference tool for health care professionals. Based on the 2010 Canadian Hypertension Education Program (CHEP), which is now part of one national hypertension organization – Hypertension Canada. This presentation is designed as an abridged overview based on the more complete program recommendations. For more information, readers are invited to log-on to www.hypertension.ca. We hope this book proves a useful and practical addition to your diagnosis and treatment of hypertension. Please be reminded, however, that all therapeutic decisions are ultimately the responsibility of the attending physician.

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2010 Canadian Hypertension Education Program
Recommendations:
The Scientific Summary –
An Update of the 2010 Theme and the Science Behind New CHEP Recommendations

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Summary
The 2010 Canadian Hypertension Education Program (CHEP) recommendations are the 11th annual update. The 2010 focus is to ensure Canadian health care professionals are updated with resources by signing up at www.htnupdate.ca. Innovative interactive internet based lectures are planned as well as programs to train community leaders in hypertension. People with hypertension can sign up at www.myBPsite.ca to receive regular hypertension updates. In 2010, there are new recommendations regarding automated office blood pressure measurement, use of angiotensin receptor blockers as an alternative to ACE inhibitors in people with ischemic heart disease and new targets for dietary sodium.

Abstract
This is a summary of the theme, key recommendations for management of hypertension and the supporting clinical evidence of the 2010 Canadian Hypertension Education Program (CHEP). In 2010, CHEP emphasizes the need for health care professionals to stay informed about hypertension through automated updates at www.htnupdate.ca. A new interactive internet based lecture series will be available in 2010 and a program to train community hypertension leaders will be expanded. Patients can also sign up to receive regular updates in a pilot program at www.myBPsite.ca. In 2010, the new recommendations include: consideration of the use of automated office blood pressure monitors; new targets for dietary sodium for the prevention and treatment of hypertension aligned with the national adequate intake values; and recommendations for considering treatment of selected hypertensive patients at high risk with calcium channel blockers/ACE inhibitor combinations and the use of angiotensin receptor blockers.

Key Words
Hypertension, High Blood Pressure, Clinical Practice Guidelines, Knowledge Translation.

Hypertension Canada
In 2010, the Canadian Hypertension Society, CHEP and Blood Pressure Canada will merge to create Hypertension Canada, a single national hypertension organization. The development and dissemination of hypertension recommendations and resources will be continued under the label of CHEP, in addition to the rigorous program for developing and implementing the recommendations.
How can I stay up-to-date with hypertension recommendations and resources?

The hypertension knowledge base continues to rapidly evolve and a large number of educational resources are being developed and regularly updated to assist health care professionals and hypertensive Canadians (Table 1). To assist health care professionals to stay current, three new programs are being launched. The first is a website, www.htnupdate.ca, where health care professionals and organizations can register to be informed about new or updated resources. The second program is an interactive web-based lecture series on clinically important hypertension topics to facilitate learning and interaction with top Canadian hypertension experts. This will be launched in 2010. Because it’s web-based, health care professionals will be able to learn from the comfort of their own home or office and take advantage of groups already developed for continuing education activities. Also in 2010, CHEP will host 4-6 hour training sessions for health care professionals to facilitate their development as leaders for hypertension education in their communities.

How can my patients stay up-to-date with hypertension recommendations and resources?

Hypertensive Canadians face challenges in finding reliable and current sources of hypertension information. CHEP and Hypertension Canada have a large number of resources for Canadians that are regularly updated (Table 2). Currently, people with hypertension must perform regular searches to stay up-to-date and may find unreliable or outdated information. To address this concern, a new hypertension association with a website at www.myBPsite.ca is being developed. Those who register will be regularly informed when new resources are developed or existing ones updated. In addition, an internet-based public lecture series is planned for 2010.

New evidence has allowed CHEP to address additional clinical questions in the management of hypertension for the 2010 recommendations.

1. Should I use an automated blood pressure monitor in my office to monitor blood pressure?

In 2010, CHEP recommends consideration of the routine office use of automated monitors designed to take multiple readings and used under proper conditions. Increasing evidence suggests automated office readings are more accurate than routine manual office blood pressure measurement in predicting target organ damage and ambulatory blood pressure readings. However, the therapeutic thresholds for interpreting automated readings remain undetermined, and at present there are no studies that directly correlate automated office readings to cardiovascular events. An automated office reading of 135/85 mm Hg is approximately equivalent to an ambulatory blood pressure reading of 135/85 mm Hg. Only one small study in a selected population (attending an ambulatory monitoring clinic) has correlated repeated automated office readings with repeated manual office readings (on which the current therapeutic thresholds are based) (2). In a representative group of Ontario adults, the automated readings were 3/3 mm Hg lower than manual readings at a single visit (3). However, in a small selected group of firefighters, the difference between automated and manual office readings disappeared over 3-5 visits (2). It is notable that other studies report much larger differences between automated office readings and manual office readings (4). Current research on which this recommendation is based often examined populations that are likely to have a high prevalence of white coat hypertension (i.e., patients referred for ambulatory blood pressure monitoring), patients whose readings were taken in a specialist office, and patients for whom the office readings were taken on one occasion, or where measurements were not performed by a trained technician using standardized techniques (4) (5;7). All of these limitations would be expected to increase the difference between automated and manual blood pressure readings and limit the ability to define the exact threshold for treating hypertension based on automated office readings in an unselected population of patients in a primary health care setting. Ongoing studies are addressing these outstanding issues in order to develop a new algorithm for diagnosing hypertension. Despite these limitations, for 2010 CHEP recommends greater use of automated blood pressure readings.

2. What should be the target for limiting dietary sodium?

CHEP recommends decreasing the target for maximal dietary sodium intake to be consistent with Health Canada’s recommended adequate dietary intake recommendations (Table 3) (8). There is increasing evidence that high dietary sodium intake is a health risk. In 2009, high dietary sodium was estimated to be the 7th leading risk factor for death in the United States (13). Worldwide, in low-to-middle income countries, reducing dietary sodium was estimated to be more cost effective than reducing smoking (although both are highly recommended) (14). Further, the benefits
of dietary sodium restriction in lowering blood pressure continue to be appreciated. In 2009, a small short term randomized study of sodium reduction in patients with resistant hypertension reported a blood pressure decrease of 22/9 mm Hg with a reduction in average sodium intake from 5,796 mg/day to 1,060 mg/day (15). Brief advice for patients to encourage reductions in dietary sodium can be found in Table 4 and resources for health care professionals and patients can be found in Tables 1 and 2.

3. Are ARBs and ACE-inhibitors equivalent?

Previous iterations of the CHEP recommendations have noted the evidence supporting the equivalence of angiotensin receptor antagonists and angiotensin-converting enzyme inhibitors in patients with hypertension with diabetes and in patients with hypertension without other significant co-morbidities. In 2010, CHEP reconsidered data from the ONTARGET (9), TRANSCEND (10) and PROFESS (11) trials. ONTARGET was a large, randomized double-blinded trial in over 25,000 patients designed to determine if telmisartan was non-inferior to ramipril at full doses and whether the combination of telmisartan and ramipril was superior to ramipril alone (9). People over age 55 years who had evidence of vascular disease or diabetes with target organ damage were randomized to either telmisartan, ramipril, or a combination of telmisartan and ramipril. There was no significant difference in the primary outcome (cardiovascular death, myocardial infarction, stroke or hospitalization for congestive heart failure) between the 3 treatment groups. The combination therapy group had more adverse events, leading CHEP to specifically recommend against the use of the combination therapy in people with uncomplicated hypertension, ischemic heart disease without heart failure, past stroke, non-proteinuric chronic kidney disease or diabetes without albuminuria.

PROFESS was a large randomized factorial trial of ARB based blood pressure reducing therapy and antiplatelet therapy to prevent recurrent strokes (11). Patients with a prior ischemic stroke who were aged 50 or older were randomized to telmisartan (ARB) or placebo. The ARB therapy neither reduced the primary endpoint of recurrent stroke (HR: 0.95 (0.86-1.04, p=0.23)) nor the secondary outcome of major cardiovascular events [stroke, MI, vascular death, worsening CHF], HR: 0.94 [0.87-1.01, p=0.11] despite a 3.8/2.0 mm Hg lower blood pressure. In secondary analyses, a small difference in favor of telmisartan began to emerge after the first 6 months of therapy. Adverse events were slightly more common with telmisartan treatment.

The TRANSCEND study comprised 5,926 people with coronary disease, prior stroke or diabetes mellitus with end-organ damage and intolerance of ACE inhibitors, who were randomized to telmisartan or placebo (10). While the mean blood pressure difference was 3.2/1.3 mm Hg lower at study end in the ARB group, the ARB therapy did not reduce the primary outcome (composite of cardiovascular death, myocardial infarction, stroke or hospitalization for heart failure). A secondary endpoint of cardiovascular death, myocardial infarction or stroke approached statistical significance: HR: 0.87 (0.76-1.00, p=0.068). Adverse event rates were similar in the two groups. The low event rates, modest reduction in blood pressure and relatively low entry blood pressures were believed to reduce the statistical power of the trial to detect a benefit of ARB in the PROFESS and TRANSCEND trials. In view of the effective equivalence of ramipril to telmisartan in ONTARGET where telmisartan was non-inferior to ramipril, and the wealth of studies demonstrating the benefits of ACE inhibitor therapy in patients with known vascular disease, CHEP has recommended that most people with ischemic heart disease should be treated with an ACE inhibitor or an ARB. Thus, in patients with ischemic heart disease (as in those with diabetes or hypertension without other significant co-morbidities), angiotensin receptor antagonists can be used interchangeably with ACE inhibitors. However, in patients with hypertension and congestive heart failure, or following a stroke, ACE inhibitors continue to be preferentially recommended.

4. Many patients with hypertension need combination therapy. Are there preferred combinations?

Previous iterations of the CHEP recommendations have given only limited advice regarding optimal drug combinations due to limited clinical trial data. There has been little additional guidance beyond recommending 1) that 2-drug combinations should include the “first-line therapies” (diuretics, CCBs, ACE inhibitors, ARBs and in younger patients beta-blockers) and 2) that ACE inhibitors, ARBs and beta-blockers should generally not be combined. The 2010 recommendations have highlighted preferred combination therapy for high risk patients based on the ACCOMPLISH study. In 2009, the ACCOMPLISH trial evaluated if benazepril [an ACE inhibitor] / amlodipine [a dihydropyridine CCB] was better than benazepril and a thiazide diuretic in hypertensive
individuals aged 55 or older who were at high cardiovascular risk due to risk factors or prior cardiovascular events (12). Although blood pressures were very similar in both groups during the trial, there was a 20% relative (2.1% absolute) reduction in cardiovascular events and deaths (9.6% vs. 11.8%, HR: 0.80 [0.72-0.90]) in those randomized to the ACE inhibitor/CCB group.

Based on the main ACCOMPLISH results, CHEP has recommended that the results from the combination ACE inhibitor/CCB group be considered when combination therapy is required in selected high risk hypertensive patients. Notably, this recommendation does not invalidate the use of an ARB/diuretic or ACE inhibitor/diuretic combinations. These formulations have been demonstrated to be useful for attaining blood pressure control in a high proportion of patients and have been linked to improved adherence with therapy (16-20). Importantly, CHEP still discourages the use of two drug antihypertensive combinations with an ACE inhibitor, ARB and beta-blockers unless there is a compelling indication such as heart failure, angina or post-myocardial infarction (21). These two drug combinations may not result in an additive hypotensive effect, and ACE inhibitor/ARB combinations do not improve outcomes but increase adverse effects, as demonstrated in the ONTARGET study (9;22).

**Comments from the CHEP executive**

CHEP will merge with the Canadian Hypertension Society and Blood Pressure Canada in 2010 to form a single national hypertension organization, Hypertension Canada. While this transition will likely be unnoticed by health care professionals, over time the merger is expected to increase efficiency and effectiveness in the prevention and control of hypertension in Canada. Canadian educational material for health care professionals and patients will carry the CHEP logo and name. For scientists, Hypertension Canada will develop a strategic plan that will sustain Canada’s strength in basic and outcomes research while enhancing Canada’s research capacity, especially in community and clinical research. It will ensure communication and collaboration between all four Canadian Institute for Health Research pillars. Reducing dietary sodium will continue to be a priority for Hypertension Canada to both prevent hypertension and to improve hypertension control.

CHEP will develop new programs in 2010 to help health care professionals and hypertensive Canadians stay up-to-date with the best evidence and resources to prevent and control hypertension. A new website, www.htnupdate.ca, will provide an opportunity for health care professionals to sign up to receive electronic notices of all new CHEP hypertension resources and updates. Those who sign up can immediately download all current resources, or the resources can be downloaded at www.hypertension.ca/tools. In addition, a new internet-based lecture series will be launched in 2010 to allow health care professionals to interact with Canadian hypertension leaders and discuss important hypertension topics. Also “train the trainer” sessions have been developed and sessions will be held in venues across Canada to train health care professionals interested in becoming community educators in hypertension.

Canada will host the biennial scientific sessions of the International Society of Hypertension in Vancouver, BC, September 26-30, 2010. Interested scientists and clinicians should plan to attend this premier clinical and scientific meeting.

The state of hypertension diagnosis, treatment and control in Canada will be much clearer in 2010. Three major national surveys will report Canada’s performance in prevention and control of hypertension in 2010. A Statistics Canada – Public Health Agency of Canada (PHAC) survey will report the national prevalence of hypertension and the awareness, treatment and control rates in February 2010. The survey is much anticipated as the latest national surveys were performed from 1985-1992 and many studies since have suggested that there are marked improvements in hypertension management (23-27). Furthermore, a detailed Statistics Canada – PHAC survey of Canadians with hypertension will report in 2010. The survey examines the knowledge, attitudes and behaviours of hypertensive Canadians and will allow tailored and likely more effective patient educational resources to be developed. Also in 2010, the first federal-provincial hypertension survey will be published, using linked provincial administrative databases. The methods for these surveys were developed in part by CHEP and allow ongoing examination of the incidence and prevalence of diagnosed hypertension in people with and without diabetes as well as linkages to total mortality rate. CHEP is developing methodology to add assessment of antihypertensive treatment and specific complications and causes of death to this survey. These surveys assess the national impact of programs to prevent and control hypertension and allow CHEP to tailor educational interventions to the objective needs of Canadians.
The CHEP executive would like to thank the over 100 health care professional volunteers, who are working with CHEP to prevent and control hypertension. The collaborative approach between volunteers from clinical practice, academia and government – with the support of the primary care professional associations, the pharmaceutical health care industry, governments, charities and scientific organizations – has been associated with marked improvements in the management and outcomes of hypertensive Canadians.

**Reference List**


**TABLE 1: Health Care Professional Resources**

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<thead>
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<th>Documents</th>
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<td>1</td>
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<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
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</tbody>
</table>

*With permission of the Canadian Hypertension Education Program
† Health care professional resources can be downloaded from www.hypertension.ca/tools and www.lowersodium.ca and people who sign up at www.htnupdate.ca will be automatically notified when resources are updated or newly developed.
5) Short scientific summary. A brief narrative summary of what is new and what is important with an emphasis on the scientific basis for the recommendations. Tables summarize key aspects of hypertension care.

6) CHEP specialist booklet. Contains the short scientific summary and the exact CHEP recommendations in a pocket booklet format.

7) Full scientific manuscripts. Detailed manuscripts that indicate the exact CHEP scientific recommendations for the management of hypertension with their scientific rationale. There are separate diagnostic and therapeutic manuscripts.

**Powerpoint Slide Sets**

1) Public Education slide set. A slide set that is intended to be used to develop a general talk on hypertension to a public and/or patient audience.

2) Background slide set. A slide set that contains information on the health risks of hypertension and key therapeutic interventions.

3) Methodology slide set. A slide set that outlines the methods CHEP uses to develop its recommendations as well as the key messages and theme for 2010.

4) Diagnostic slide set. A slide set that outlines the diagnostic recommendations of CHEP as well as the key messages and theme for 2010.

5) Treatment slide set. A slide set that outlines the treatment recommendations of CHEP as well as the key messages and theme for 2010.

6) Blood Pressure Measurement slide set. A slide set that outlines the measurement recommendations for blood pressure and includes advice on office, home and ambulatory blood pressure.

7) Outcomes slide set. A slide set that outlines the various surveillance methods used by CHEP as well as key outcomes associated with CHEP. Ongoing hypertension management gaps are featured.

8) Hypertension Resources slide set. A new slide set that outlines what Canadian hypertension resources are available.

**Website Resources**

1) www.hypertension.ca/tools: to download current resources for health care professionals and patients.

2) www.htnupdate.ca: to sign up to be regularly updated on new and updated resources for health care professionals and patients and educational opportunities for health care professionals.

3) www.lowersodium.ca: for educational resources for health care professionals and patients on dietary sodium.

**Dietary Sodium Resources**

1) A short scientific summary of the importance of reducing dietary sodium with advice on how to reduce dietary sodium.

2) A scientific summary of the evidence for lowering dietary sodium.

3) Key messages on the importance of lowering dietary sodium with brief intervention advice.

**Dietary Sodium Powerpoint Slide Sets**

1) Scientific and Clinical slide set. A slide set intended to be used to develop a talk for a clinical or scientific audience.

2) Public slide set. A slide set that is intended to be used to develop a talk on dietary sodium to a public and patient audience on hypertension.

3) Sodium Quiz.

**TABLE 2: Resources for Canadians Who Have Hypertension**

**Documents, powerpoint slides and DVDs**

1) Brief public hypertension recommendations. A single page brochure that summarizes hypertension and its management to people who have hypertension or are at risk. The summary is based on the 2010 CHEP health care professional management recommendations.

2) Public hypertension recommendations. A 4-page summary of hypertension and its management to people who have hypertension or are at risk. The summary is based on the 2010 CHEP health care professional management recommendations. The 2007 recommendations are available in 4 Indo-Asian languages and cultural translations.
3) Hypertension in diabetes. A 4-page summary of hypertension and its management for people who have hypertension and diabetes. The summary is based on the 2010 CHEP health care professional management recommendations.

4) How to measure your blood pressure at home. A one-page summary of how to purchase and use a home measurement device.

5) Home measurement of blood pressure. A more detailed 4-page summary of how to purchase and use a home measurement device.

6) Measuring blood pressure the right way. A poster and small card that outlines pictorially the key steps to measuring blood pressure properly at home.

7) Home measurement DVD. A DVD that has a short and longer summary of how to measure your blood pressure at home as well as how to purchase and use home measurement of blood pressure devices.

8) Public education DVD (‘Hypertension: The Silent Killer’). A short and longer summary of hypertension on DVD for the public or those with or at risk of having hypertension.

9) Brief action tool. A set of 3 tools to be used by a health care professional educator to engage a patient more fully in his/her care. Action tool 1 takes about 4 minutes to complete. It defines BP, why a patient needs to be concerned if he/she has high BP, and the risks of hypertension. Action tool 2 takes 10 minutes and basically motivates a patient to think about changing his/her lifestyle. Action tool 3 takes 7 minutes to complete. It talks about home measurement and recording of BP, as well as information on BP medication.

10) Public education hypertension slide set. A slide set that is intended to be used by a knowledgeable health care professional in developing a presentation on hypertension to the public or people with hypertension.

Dietary Sodium

1) Public education dietary sodium slide set. A slide set that is intended to be used by a knowledgeable health care professional in developing a presentation on dietary sodium to the public or people with hypertension.

2) Get the facts. A one page summary of the importance of reducing dietary sodium and the key mechanisms to reduce dietary sodium.

3) Short summary. A very short summary of why reducing dietary sodium is important and how to reduce dietary sodium.

4) Booklet. A more detailed summary of why it is important to reduce dietary sodium and how to reduce dietary sodium for the more interested consumer.

5) Brochure. Beyond the salt shaker – Lower your sodium intake and improve your health.

6) Quiz. A short series of questions and answers for people to use to test their sodium knowledge. It is in a powerpoint format for use in talks.

Websites

1) www.myBPsite.ca: To join a hypertension association and be regularly updated on hypertension resources and materials that are available.

2) www.hypertension.ca/bpc: To download patient related resources.

3) www.hypertension.ca/chs: To examine the different home measurement devices that have passed international accuracy standards, are available in Canada and been approved by the Canadian Hypertension Society.

4) www.lowersodium.ca: Patient and health care professional information on dietary sodium.

5) www.sodium101.ca: Public information on dietary sodium.

6) www.heartandstroke.ca/bp: For an individualized action plan for lifestyle change and monitoring of blood pressure.

7) www.nhlbi.nih.gov/hbp/prevent/h_eating/h_eating.htm: For detailed information on eating the DASH diet.
**TABLE 3: Targets for Dietary Sodium**

<table>
<thead>
<tr>
<th>Age</th>
<th>Adequate Intake (mg)</th>
<th>Upper Limit (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>19-31</td>
<td>1,500</td>
<td>2,300</td>
</tr>
<tr>
<td>31-50</td>
<td>1,500</td>
<td>2,300</td>
</tr>
<tr>
<td>51-70</td>
<td>1,300</td>
<td>2,300</td>
</tr>
<tr>
<td>71 and over</td>
<td>1,200</td>
<td>2,300</td>
</tr>
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† To prevent and control hypertension, adults should be advised to eat the level recommended as adequate intake and avoid eating over the upper limit.

**TABLE 4: Advice for People to Assist Them to Reduce Dietary Sodium**

**DO**
- Buy and eat more fresh foods especially fruits and vegetables.
- Choose processed foods with low salt labels or brands with the lowest percentage of sodium on the food label.
- Wash canned foods or other salty foods in water before eating or cooking.
- If desired, use unsalted spices to make foods taste better.
- Eat less food at restaurants and fast food outlets and ask for less salt to be added in your food orders.
- Use less sauces on your food.
- Eat foods with less than 200 mg of sodium or less than 10% of the daily value per serving.

**DON’T**
- Buy or eat heavily salted foods (e.g., pickled foods, salted crackers or chips, processed meats, etc.).
- Add salt in cooking and at the table.
- Eat foods with more than 400 mg of sodium or more than 20% of the daily value per serving.
I ACCURATE MEASUREMENT OF BLOOD PRESSURE

1) Health care professionals who have been specifically trained to measure blood pressure (BP) accurately should assess BP in all adult patients at all appropriate visits to determine cardiovascular risk and monitor antihypertensive treatment (Grade D).

2) Use of standardized measurement techniques (Table 1) is recommended when assessing blood pressure (Grade D).

3) Automated office blood pressure measurements can be used in the assessment of office blood pressure (Grade D).

4) When used under proper conditions, automated office SBP of 135 mm Hg or higher or DBP values of 85 mm Hg or higher should be considered analogous to mean awake ambulatory SBP of 135 mm Hg or higher and DBP of 85 mm Hg or higher, respectively (Grade D).

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

1) At initial presentation, patients demonstrating features of a hypertensive urgency or emergency (Table 2) should be diagnosed as hypertensive and require immediate management (Grade D).

2) If systolic BP (SBP) is ≥140 mm Hg and/or diastolic BP (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 mm Hg and/or DBP is ≥90 mm Hg, at least two more readings should be taken during the same visit using a validated device and according to the recommended procedure for accurate BP determination (Table 1). The first reading should be discarded and the latter two averaged. A history and physical examination should be performed and, if clinically indicated, diagnostic tests to search for target organ damage (Table 3) and associated cardiovascular risk factors (Table 4) should be arranged within two visits. Exogenous factors that can induce or aggravate hypertension should be assessed and removed if possible (Table 5). Schedule visit two within one month (Grade D).

4) At visit two 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 and/or DBP is ≥90 mm Hg (Grade D).

5) At visit two for the assessment of hypertension, patients without macrovascular target organ damage, diabetes mellitus, and/or chronic kidney disease 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 three approaches outlined below:

i) Office manual BPs: Using office manual BP measurements, 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 monitoring (ABPM): Using ABPM (see Section VIII), 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 24h SBP is ≥130 mm Hg or the DBP is ≥80 mm Hg (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 the DBP is ≥85 mm Hg (Grade C). If the average home BP is less than 135/85 mm Hg, it is advisable to perform 24h ABPM to confirm that the mean 24h 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 below) (Grade D).

7) If at the last diagnostic visit the patient is not diagnosed to be hypertensive, and has no evidence of macrovascular target organ damage, the patient’s BP should be assessed at yearly intervals (Grade D).
8) Hypertensive patients receiving lifestyle modification advice alone (nonpharmacological treatment) should be followed up at three-to six-month intervals. Shorter intervals (every one or two months) are needed for patients with higher BPs (Grade D).

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

III ASSESSMENT OF OVERALL CARDIOVASCULAR RISK IN HYPERTENSIVE PATIENTS

1) Global cardiovascular risk should be assessed. Multifactorial risk assessment models can be used to predict more accurately an individual’s global cardiovascular risk [Grade A] and to use antihypertensive therapy more efficiently [Grade D]. In the absence of Canadian data to determine the accuracy of risk calculations, avoid using absolute levels of risk to support treatment decisions [Grade C].

2) Consider informing patients of their global risk to improve the effectiveness of risk factor modification [Grade C].

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

1) Routine laboratory tests that should be performed for the investigation of all patients with hypertension include:
   i) urinalysis [Grade D]
   ii) blood chemistry [potassium, sodium and creatinine] [Grade D]
   iii) fasting blood glucose [Grade D]
   iv) fasting serum total cholesterol and high density lipoprotein cholesterol, low density 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) i) All treated hypertensive patients should be monitored according to the current Canadian Diabetes Association (CDA) guidelines for the new appearance of diabetes [Grade B].
    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 greater than 55 or less than 30 years
   ii) the presence of an abdominal bruit
   iii) hypertension resistant to three or more drugs
   iv) a rise in serum creatinine level of ≥30% associated with use of an angiotensin-converting enzyme inhibitor or angiotensin II receptor antagonist
   v) other atherosclerotic vascular disease, particularly in patients who smoke or have dyslipidemia
   vi) recurrent pulmonary edema associated with hypertensive surges

2) When available, the following tests are recommended to aid in the usual screening for renal vascular disease: captopril-enhanced radioisotope renal scan, Doppler sonography, magnetic resonance angiography, and CT-angiography [for those with normal renal function] [Grade B]. Captopril-enhanced radioisotope renal scan is not recommended for those with CKD [GFR <60 mL/min] [Grade D].

VI ENDOCRINE HYPERTENSION

A) Hyperaldosteronism: Screening and Diagnosis

1) Screening for hyperaldosteronism should be considered for the following patients [Grade D]:
   i) hypertensive patients with spontaneous hypokalemia (K+ less than 3.5 mmol/L)
ii) hypertensive patients with marked diuretic-induced hypokalemia (K+ less than 3.0 mmol/L)

iii) patients with hypertension refractory to treatment with three or more drugs

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 [Section iii]), a diagnosis of primary aldosteronism should be established by demonstrating inappropriate autonomous hypersecretion of aldosterone using at least one of the maneuvers listed in Table 6 (Section iv). When the diagnosis is established, the abnormality should be localized using any of the tests described in Table 6 (Section 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) 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

   iv) patients with incidentally discovered adrenal mass, patients with hypertension and multiple endocrine neoplasia (MEN) 2A or 2B, von Recklinghausen’s neurofibromatosis, or von Hippel-Lindau disease

3) For patients with positive biochemical screening tests, localization of pheochromocytomas should employ magnetic resonance imaging [preferable], computed tomography [if MRI unavailable], and/or iodine I-131 metaiodobenzylguanidine (MIBG) scintigraphy (Grade C for each modality).

VII HOME MEASUREMENT OF 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)

   ii) chronic kidney disease (Grade C)

   iii) suspected non-adherence (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 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 DBP values ≥85 mm Hg should be considered elevated and associated with an increased overall mortality risk analogous to office SBP readings of ≥140 mm Hg or DBP ≥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) Home BP values for assessing white coat hypertension or sustained hypertension should be based on duplicate measures, morning and evening, for an initial seven-day period. First day home BP values should not be considered (Grade D).

VIII AMBULATORY BLOOD PRESSURE MEASUREMENT
1) Ambulatory BP readings can be used in the diagnosis of hypertension (Grade C).

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)
   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 a 24h ambulatory SBP of $\geq 130$ mm Hg or DBP of $\geq 80$ mm Hg or an awake SBP of $\geq 135$ mm Hg or DBP of $\geq 85$ mm Hg (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).

DIAGNOSIS & ASSESSMENT TABLES

TABLE 1: Recommended Technique for Measuring Blood Pressure†*

1) 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. Aneroid devices or mercury columns need to be clearly visible at eye level.

2) 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.

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

† Unless specifically mentioned, steps apply to measurement by auscultation and oscillometry using an upper arm cuff.

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same position. The first reading should be discarded and the latter two averaged.

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

Steps 4 to 7 are specific to auscultation.

4) 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).

5) Place the bell or diaphragm of the stethoscope gently and steadily over the brachial artery.

6) 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.

7) 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)). 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. 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.

8) 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.

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

10) 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.

11) 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.

TABLE 2:
Examples of Hypertensive Urgencies and Emergencies*

Asymptomatic diastolic BP ≥130 mm Hg
Hypertensive encephalopathy
Acute aortic dissection
Acute left ventricular failure
Acute myocardial ischemia

TABLE 3:
Examples of Target Organ Damage*

Cerebrovascular Disease
Stroke
Ischemic stroke and transient ischemic attack
Intracerebral hemorrhage
Aneurysmal sub-arachnoid hemorrhage
Dementia
Vascular dementia
Mixed vascular dementia and dementia of the Alzheimer’s type

Hypertensive Retinopathy

Left Ventricular Dysfunction
Left ventricular hypertrophy

Coronary Artery Disease
Myocardial infarction
Angina pectoris
Congestive heart failure

Renal Disease
Chronic kidney disease (GFR <60 mL/min)
Albuminuria

Peripheral Artery Disease
Intermittent claudication

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

**Prior history of clinically overt atherosclerotic disease** indicates a very high risk for a recurrent atherosclerotic event [e.g., peripheral arterial disease, previous stroke or TIA].

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

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

TABLE 5:
Examples of Exogenous Factors That Can Induce/Aggravate Hypertension*

**Prescription Drugs**
- NSAIDs, including coxibs
- Corticosteroids and anabolic steroids
- Oral contraceptives and sex hormones
- Vasoconstricting/sympathomimetic decongestants
- Calcineurin inhibitors (cyclosporine, tacrolimus)
- Erythropoietin and analogues

**Antidepressants:**
- Monoamine oxidase inhibitors (MAOIs), serotonin-norepinephrine reuptake inhibitors (SNRIs), selective serotonin reuptake inhibitors (SSRIs)
- Midodrine

**Other Substances**
- Licorice root
- Stimulants including cocaine
- Salt
- Excessive alcohol use

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TABLE 6:
Hyeraldosteronism: Screening and Diagnosis*

1) Plasma aldosterone and plasma renin activity (see Section 2 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.

2) Renin, Aldosterone and Ratio Conversion Factors:

<table>
<thead>
<tr>
<th>A. To estimate:</th>
<th>B. From:</th>
<th>Multiply (B) by:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plasma renin concentration [ng/mL]</td>
<td>Plasma renin activity [ng/mL/hr]</td>
<td>0.206</td>
</tr>
<tr>
<td>Plasma renin activity [ng/L/hr]</td>
<td>Plasma renin activity [ng/mL/hr]</td>
<td></td>
</tr>
<tr>
<td>Plasma aldosterone concentration [pmol/L]</td>
<td>Plasma aldosterone concentration [ng/dL]</td>
<td>28</td>
</tr>
</tbody>
</table>

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

4) Maneuvers to demonstrate autonomous hypersecretion of aldosterone:

a) saline loading tests [2L of normal saline over 4h with primary aldosteronism defined as failure to suppress plasma aldosterone to less than 280 pmol/L; or oral sodium 300 mmol/day for three days with primary aldosteronism defined as failure to suppress plasma aldosterone to less than 240 pmol/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 to PRA ratio greater than 1,400 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

* With permission of the Canadian Hypertension Education Program
less than 240 pmol/L two hours after 25 mg of oral captopril

5) 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 2h to 4h of upright posture
   b) for patients with established primary aldosteronism and negative imaging studies, selective adrenal venous sampling should be considered because it may be the only way to reliably differentiate unilateral from bilateral overproduction of aldosterone. Adrenal venous sampling should be conducted in centres with experience in performing this diagnostic technique.

TABLE 7:

Pheochromocytoma: Screening and Diagnosis*

Biochemical screening tests for pheochromocytomas:
   a) to screen for pheochromocytomas, 24h 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 500 ng/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*

Elevated Out-of-the-Office BP Measurement

Elevated Random Office BP Measurement

Hypertension Visit 1
BP Measurement, History and Physical

Diagnostic tests ordering at visit 1 or 2

Hypertensive Urgency / Emergency

Hypertension Visit 2
within 1 month

BP ≥180/110 mm Hg OR
BP 140-179/90-109 mm Hg
with Target Organ Damage, Diabetes
or Chronic Kidney Disease

Yes

Diagnosis of HTN

No

Clinic BPM

Hypertension Visit 3
≥160 mm Hg SBP or
≥100 mm Hg DBP

Diagnosis of HTN

<160/100 mm Hg
or

ABPM or Home BPM if available

Hypertension Visit 4-5
≥140 mm Hg SBP or
≥90 mm Hg DBP

Diagnosis of HTN

<140/90 mm Hg

Continue to follow-up

ABPM (if available)

Awake BP
<135/85 mm Hg
and
24-hour
<130/80 mm Hg

≥135 mm Hg SBP or
≥85 mm Hg DBP

≥130 mm Hg SBP or
≥80 mm Hg DBP

Awake BP

≥135 mm Hg SBP

≥85 mm Hg DBP

≥24-hour

≥130 mm Hg SBP

≥80 mm Hg DBP

Diagnosis of HTN

Continue to follow-up

Home BPM (if available)

<135/85 mm Hg

≥135 mm Hg SBP

≥85 mm Hg DBP

≥24-hour

≥130 mm Hg SBP

≥80 mm Hg DBP

Diagnosis of HTN

Continue to follow-up

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I LIFESTYLE MANAGEMENT

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

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 to 24.9 kg/m² and WC less than 102 cm for men and less than 88 cm for women) is recommended for non-hypertensive individuals to prevent hypertension (Grade C) and for hypertensive patients to reduce blood pressure (Grade B). All overweight hypertensive individuals should be advised to lose weight (Grade B).
3) Weight loss strategies should 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 two drinks or less per day, and consumption should not exceed 14 standard drinks per week for men and nine standard drinks per week for women (Grade B). [Note: one standard drink is considered 13.6 g or 17.2 mL of ethanol, or approximately 44 mL [1.5 oz] of 80 proof [40%] spirits, 355 mL [12 oz] of 5% beer or 148 mL [5 oz] of 12% wine].

D) Dietary Recommendations
1) It is recommended that hypertensive patients and normotensive individuals at increased risk of developing hypertension consume a diet that emphasizes fruits, vegetables, 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 1) (Grade B).

E) Salt Intake
1) For prevention and treatment of hypertension, a dietary sodium intake of 1,500 mg [65 mmol] per day is recommended for adults age 50 years or less; 1,300 mg [57 mmol] per day if age 51 to 70 years; and 1,200 mg [52 mmol] per day if age greater than 70 years (Grade B).

F) Potassium, Calcium and Magnesium Intake
1) Supplementation of potassium, calcium and magnesium is not recommended for the prevention or treatment of hypertension (Grade B).

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

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

1) Antihypertensive therapy should be prescribed for average diastolic blood pressures of 100 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.

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 ± 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 non-black patients, Grade B); a long-acting CCB (Grade B) or an ARB (Grade B). If there are adverse effects, another drug from this group should be substituted. Hypokalemia should be avoided in patients treated with thiazide diuretic monotherapy (Grade C).

2) Additional antihypertensive drugs should be used if target blood pressure levels are not achieved with standard-dose monotherapy (Grade B). Add-on drugs should be chosen from first-line choices. Useful choices include a thiazide diuretic or CCB with either an ACE inhibitor, ARB or beta-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 nondihydropyridine CCB and a beta-blocker (Grade D). The combination of an ACE inhibitor and ARB is not recommended (Grade A).

3) Combination therapy using two first-line agents may also be considered as initial treatment of hypertension (Grade C) if systolic blood pressure is 20 mm Hg above target or if diastolic blood pressure is 10 mm Hg above target. However, caution should be exercised in patients in whom a substantial fall in blood pressure from initial combination therapy is more likely to occur or in whom it would be more poorly tolerated (e.g., elderly patients).

4) If blood pressure is still not controlled with a combination of two or more first-line agents, or there are adverse effects, other antihypertensive drugs may be added (Grade D).

5) Possible reasons for poor response to therapy (Table 2) should be considered (Grade D).

6) Alpha-blockers are not recommended as first-line agents for uncomplicated hypertension (Grade A); beta-blockers are not recommended as first-line therapy for uncomplicated hypertension in patients 60 years of age or older (Grade A); and ACE inhibitors are not recommended as first-line therapy for uncomplicated hypertension in black patients (Grade A). However, these agents may be used in patients with certain 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 options (Grade D).

3) If blood pressure is still not controlled with a combination of two or more first-line agents, or there are adverse effects, other classes of drugs (such as alpha-blockers, ACE inhibitors, centrally acting agents or nondihydropyridine CCBs) may be added or substituted (Grade D).

4) Possible reasons for poor response to therapy (Table 2) should be considered (Grade D).

5) Alpha-blockers are not recommended as first-line agents for uncomplicated isolated systolic hypertension (Grade A); beta-blockers are not recommended as first-line therapy for isolated systolic hypertension in patients 60 years of age or older (Grade A). However, both agents may be used in patients with certain comorbid conditions or in combination therapy.
IV GLOBAL VASCULAR PROTECTION THERAPY FOR ADULTS WITH HYPERTENSION WITHOUT COMPELLING INDICATIONS FOR SPECIFIC AGENTS

1) Statin therapy is recommended in hypertensive patients with three or more cardiovascular risk factors as defined in Table 3 (Grade A in patients older than 40 years), or with established atherosclerotic disease (Grade A regardless of age).

2) Strong consideration should be given to the addition of low-dose acetylsalicylic acid therapy in hypertensive patients (Grade A in patients older than 50 years). Caution should be exercised if blood pressure is not controlled (Grade C).

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

1) The systolic blood pressure treatment goal is a pressure level of less than 140 mm Hg (Grade C). The diastolic blood pressure treatment goal is a pressure level of less 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 or ARB is recommended for most patients with hypertension and coronary artery disease (Grade A).

2) For patients with stable angina, beta-blockers are preferred as initial therapy (Grade B). CCBs may also be used (Grade B).

3) Short-acting nifedipine should not be used (Grade D).

4) For patients with coronary artery disease, but without coexisting systolic heart failure, the combination of an ACE inhibitor and ARB is not recommended (Grade B).

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 can be used if the patient is intolerant of an ACE inhibitor (Grade A in patients with left ventricular systolic dysfunction).

2) CCBs may be used in post-myocardial infarction patients when beta-blockers are contraindicated or not effective. Nondihydropyridine CCBs should not be used when there is heart failure, as evidenced by pulmonary congestion on examination or radiography (Grade D).

VII TREATMENT OF HYPERTENSION IN ASSOCIATION WITH HEART FAILURE

1) In patients with systolic dysfunction, 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 post-myocardial infarction. Other diuretics are recommended as additional therapy if needed (Grade B for thiazide diuretics for blood pressure control and Grade D for loop diuretics for volume control). Beyond considerations of blood pressure control, doses of ACE inhibitors or ARBs should be titrated to those found to be effective in trials unless adverse effects become manifest (Grade B).

2) An ARB is recommended if ACE inhibitors are not tolerated (Grade A).

3) A combination of hydralazine and isosorbide dinitrate is recommended if ACE inhibitors and ARBs are contraindicated or not tolerated (Grade B).

4) For hypertensive patients whose blood pressure is not controlled, an ARB may be added to an ACE inhibitor and other antihypertensive drug treatment (Grade A). Careful monitoring should be used if combining an ACE inhibitor and an ARB due to potential adverse effects such as hypotension, hyperkalemia and worsening renal function (Grade C). Additional therapies may also include dihydropyridine CCBs (Grade C).

VIII TREATMENT OF HYPERTENSION IN ASSOCIATION WITH 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).

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 less than 140/90 mm Hg (Grade C).

4) Treatment with an ACE inhibitor/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 <130/80 mm Hg (Grade C).

2) For patients with hypertension and proteinuric chronic kidney disease (urinary protein >500 mg/24h or albumin to creatinine ratio [ACR] >30 mg/mmol), initial therapy should be an ACE inhibitor (Grade A) or an ARB if there is intolerance to ACE inhibitors (Grade B).

3) Thiazide diuretics are recommended as additive antihypertensive therapy (Grade D). For patients with chronic kidney disease and volume overload, loop diuretics are an alternative (Grade D).

4) In most cases, combination therapy with other antihypertensive agents may be needed to reach target blood pressures (Grade D).

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

**XI TREATMENT OF HYPERTENSION IN ASSOCIATION WITH RENOVASCULAR DISEASE**

1) Renovascular hypertension should be treated in the same manner as hypertension without compelling indications, except for caution in the use of ACE inhibitors or ARBs due to the risk of acute renal failure in bilateral disease or unilateral disease with a solitary kidney (Grade D).

2) Close follow-up and early intervention (angioplasty and stenting or surgery) should be considered for patients with uncontrolled hypertension despite therapy with three or more drugs, deteriorating kidney function, bilateral atherosclerotic renal artery lesions (or tight atherosclerotic stenosis in a single kidney) or recurrent episodes of flash pulmonary edema (Grade D).

**XII TREATMENT OF HYPERTENSION IN ASSOCIATION WITH DIABETES MELLITUS**

1) Persons with diabetes mellitus should be treated to attain systolic blood pressures of less than 130 mm Hg (Grade C) and diastolic blood pressures of less 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 treatment of hypertension (Grade B) if systolic blood pressure is 20 mm Hg above target or if diastolic blood pressure is 10 mm Hg above target. However, caution should be exercised in patients in whom a substantial fall in blood pressure is more likely or poorly tolerated (e.g., elderly patients and patients with autonomic nephropathy).

2) For persons with diabetes and normal urinary albumin excretion (ACR of less than 2.0 mg/mmol in men and less than 2.8 mg/mmol in women) and without chronic kidney disease, with blood pressures of 130/80 mm Hg or higher despite lifestyle interventions, any one of the following are recommended: an ACE inhibitor (Grade A for persons aged 55 years of age or older, and Grade B for persons younger than 55 years), ARB (Grade A for persons with left ventricular hypertrophy and 55 years of age or older, and Grade B for persons without left ventricular hypertrophy irrespective of age), dihydropyridine CCB (Grade A for persons aged 55 years of age or older, and...
Grade B for persons younger than 55 years of age), or thiazide or thiazide-like diuretic (Grade A for persons 55 years of age or older, and Grade B for persons younger than 55 years), with special consideration to the 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) can be substituted. Additional antihypertensive drugs should be used if target blood pressure levels are 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 persons 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 persons with diabetes and a normal urinary albumin excretion rate (ACR lower than 2.0 mg/mmol in men or 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 persons with diabetes (Grade A).

XIII ADHERENCE STRATEGIES FOR PATIENTS

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

XIV TREATMENT OF SECONDARY HYPERTENSION DUE TO ENDOCRINE CAUSES

1) Treatment of hyperaldosteronism and pheochromocytoma are outlined in Tables 5 and 6.

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

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


* With permission of the Canadian Hypertension Education Program
### TABLE 2:
**Possible Reasons for Poor Response to Antihypertensive Therapy***

Non-compliance  
Dietary  
Medication  

Associated Conditions  
Obesity  
Cigarette smoking  
Excessive alcohol consumption  
Sleep apnea  
Chronic pain  

Drug Interactions  
Nonsteroidal anti-inflammatory drugs (including cyclo-oxyn-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]  

**Monoamine oxidase inhibitors, certain selective serotonin reuptake inhibitors and serotonin-norepinephrine reuptake inhibitors**  

Suboptimal Treatment Regimens  
Dosage too low  
Inappropriate combinations of antihypertensive agents  

Volume Overload  
Excessive salt intake  
Renal sodium retention (pseudo-tolerance)  

Secondary Hypertension  
Renal insufficiency  
Renovascular disease  
Primary hyperaldosteronism  
Thyroid disease  
Pheochromocytoma and other rare endocrine causes  
Obstructive sleep apnea  

---

Note that causes of 'pseudo-resistance' (such as white coat hypertension or pseudo-hypertension in the elderly) should be ruled out first. Adapted from reference [25].

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

**Risk Factor**

- Male sex
- Age ≥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 high-density lipoprotein ratio ≥6

### TABLE 4:  
**Strategies to Improve Patient Adherence***

1) Assist your patient to adhere by:
   i) Tailoring pill-taking to fit patients' daily habits [Grade D]
   ii) Simplifying medication regimens to once-daily dosing [Grade D]
   iii) Replacing multiple pill antihypertensive combinations with single pill combinations [Grade C]
   iv) Utilizing unit-of-use packaging [of several medications to be taken together] [Grade D]
   v) Adherence to an antihypertensive prescription can be improved by a multidisciplinary team approach [Grade B]

---

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† If hypertensive patients have three or more of these risk factors, statins should be considered. Derived from reference [26].

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2) Assist your patient in getting more involved in their treatment by:
   vi) Encouraging greater patient responsibility/autonomy in monitoring their blood pressure and adjusting their prescriptions (Grade C)
   vii) Educating patients and patients’ families about their disease and treatment regimens (Grade C)
3) Improve your management in the office and beyond by:
   viii) Assessing adherence to pharmacological and non-pharmacological therapy at every visit (Grade D)
   ix) Encouraging adherence with therapy by out-of-office contact (either by phone or mail), particularly during the first three months of therapy (Grade D)
   x) Coordinating with work-site healthcare givers to improve monitoring of adherence with pharmacological and lifestyle modification prescriptions (Grade D)
   xi) Utilizing electronic medication compliance aids (Grade D)

TABLE 5:
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 before surgery to correct metabolic abnormalities and to control blood pressure.
3) For primary aldosteronism patients with adrenal hyperplasia, bilateral adenoma or increased risk of perioperative complications, treatment is medical.
4) Medical treatment should be initiated with spironolactone 25-400 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 calcium channel blockers may be useful to control blood pressure.
5) Because many APA patients will remain hypertensive following the surgical removal of an APA, these patients should be followed and, if necessary, treated according to the usual guidelines for non-endocrine hypertension.

TABLE 6:
Treatment Recommendations for Patients with Pheochromocytoma*

1) Alpha-blockers (prazosin, doxazosin, terazosin and phenoxybenzamine) should be used as first-line agents in suspected pheochromocytoma. Alpha methylidopa 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), terazosin (2-10 mg bid) or doxazosin (2-4 mg bid-tid) is indicated for patients with severe paroxysmal or sustained hypertension
   v) The tyrosine hydroxylase inhibitor metyrosine (0.25-1 g 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

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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, terazosin, doxazosin, terazosin, prazosin, and alpha-blockers) plus beta-blockade and/or tyrosine hydroxylase inhibition with metyrosine. A combination of cyclophosphamide, vincristine, and dacarbazine may be used for chemotherapy of metastatic pheochromocytoma. Treatment with high dose I-131 – MIBG induces only a moderate response, but may help control of blood pressure.

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**TABLE 7:**

**Considerations in the Individualization of Antihypertensive Therapy**

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

<table>
<thead>
<tr>
<th></th>
<th>Initial Therapy</th>
<th>Second-line Therapy</th>
<th>Notes and/or Cautions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HYPERTENSION WITHOUT OTHER COMPELLING INDICATIONS - TARGET &lt; 140/90 mm Hg</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diastolic +/- systolic hypertension</td>
<td>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 two first-line drugs if the blood pressure is ≥20 mm Hg systolic or ≥10 mm Hg diastolic above target.</td>
<td>Combinations of first-line drugs</td>
<td>Beta-blockers not recommended as initial therapy in those older than 60 years of age. Hypokalemia should be avoided by using potassium-sparing agents in those who prescribed diuretics as monotherapy. ACE inhibitors are not recommended in blacks as 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 specifically not recommended.</td>
</tr>
<tr>
<td>Isolated systolic hypertension without other compelling indications</td>
<td>Thiazide diuretics, ARBs or long-acting dihydropyridine calcium channel blockers</td>
<td>Combinations of first-line drugs</td>
<td>Same as diastolic +/- systolic hypertension</td>
</tr>
</tbody>
</table>

| **DIABETES MELLITUS - TARGET < 130/80 mm Hg** |                                                                                     |                                                                                     |                                                                                     |
| Diabetes mellitus with albuminuria^              | ACE inhibitors or ARBs                                                                                     | Addition of thiazide diuretics, cardioselective beta-blockers, long-acting CCBs | If the serum creatinine level is >150 μmol/L, a loop diuretic should be used as a replacement for low-dose thiazide diuretics if volume control is required. |
### INITIAL THERAPY

**Diabetes mellitus without albuminuria**
- ACE inhibitors, ARBs, dihydropyridine CCBs or thiazide diuretics

**Combination of first-line drugs; or if first-line agents are not tolerated, addition of cardiodepressive beta-blockers and/or long-acting nondihydropyridine CCBs**
- Normal albumin to creatinine ratio (ACR) < 2.0 mg/mmol in men and < 2.8 mg/mmol in women. Combination of an ACE inhibitor with an ARB is specifically not recommended.

### CARDIOVASCULAR DISEASE - TARGET < 140/90 mmHg

**Coronary artery disease**
- ACE inhibitors or ARBs (except in low-risk patients); beta-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.

**Prior myocardial infarction**
- Beta-blockers, ACE inhibitors (ARBs if ACEI intolerant)

**Long-acting CCBs**
- 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 ACE inhibitors and ARBs to those used in clinical trials. Avoid nondihydropyridine CCBs (diltiazem, verapamil). Monitor potassium and renal function if combining an ACE inhibitor with an ARB.

**Left ventricular hypertrophy**
- Does not affect initial treatment recommendations

**Combinations of additional agents**
- Hydralazine and minoxidil can increase left ventricular hypertrophy

**Past Stroke or TIA**
- ACE inhibitor/diuretic combinations

**Combinations of additional agents**
- This does not apply to acute stroke. Blood pressure reduction reduces recurrent strokes in stable patients. Combination of an ACE inhibitor with an ARB is specifically not recommended.

### NON-DIABETIC CHRONIC KIDNEY DISEASE - TARGET < 130/80 mmHg

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

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

**Renovascular disease**
- Does not affect initial treatment recommendations

**Combinations of additional agents**
- Avoid ACE inhibitors or ARBs if bilateral renal artery stenosis or unilateral disease with solitary kidney

### OTHER CONDITIONS - TARGET < 140/90 mmHg

**Peripheral arterial disease**
- Does not affect initial treatment recommendations

**Combinations of additional agents**
- Avoid beta-blockers with severe disease

**Dyslipidemia**
- Does not affect initial treatment recommendations

**Combinations of additional agents**

**Overall vascular protection**
- Statin therapy for patients with 3 or more cardiovascular risk factors or atherosclerotic disease. Low dose ASA in patients with controlled blood pressure.

**Caution should be exercised with the ASA recommendation if blood pressure is not controlled.**

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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.

† Albuminuria is defined as persistent albumin to creatinine ratio (ACR) < 2.0 mg/mmol in men and < 2.8 mg/mmol in women.

‡ Proteinuria is defined as urinary protein >300 mg/24h or albumin to creatinine ratio (ACR) >30 mg/mmol.

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

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Treatment of Systolic-Diastolic Hypertension without Other Compelling Indications

**TARGET <140/90 mm Hg**

- **Lifestyle Modification Therapy**
- A combination of two first-line drugs may be considered as initial therapy if the blood pressure is ≥20 mm Hg systolic or ≥10 mm Hg diastolic above target†

**CONSIDER**
- Nonadherence?
- Secondary HTN?
- Interfering drugs or lifestyle?
- White coat effect?

† Caution should be exercised in patients where a substantial fall in blood pressure is more likely or more poorly tolerated (e.g., elderly) from initial combination therapy.

†† Not indicated as first-line therapy for age 60 and above.

ACEIs, ARBs and renin inhibitors are contraindicated in pregnancy and caution is required in prescribing to women of child bearing potential.

Treatment of Hypertension in Association with Diabetes Mellitus: Summary

Threshold equal or over 130/80 mm Hg and TARGET below 130/80 mm Hg

<table>
<thead>
<tr>
<th>With Nephropathy</th>
<th>Without Nephropathy</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARB or ACEI</td>
<td>ARB or ACEI or Thiazide diuretic or DHP-CCB</td>
</tr>
</tbody>
</table>

≥2-drug combinations

Monitor serum potassium and creatinine carefully in patients with CKD prescribed an ACEI or ARB.

Combination of an ACEI with an ARB is specifically not recommended in the absence of proteinuria.

More than three drugs may be needed to reach target values for diabetic patients.

If creatinine over 150 µmol/L or creatinine clearance below 30 mL/min (0.5 mL/sec), a loop diuretic should be substituted for a thiazide diuretic if control of volume is desired.

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