BCGuidelines.ca
Guidelines & Protocols Advisory Committee

Hypertension – Diagnosis and Management

Effective Date: March 1, 2015
Revised Date: June 22, 2016

Scope

This guideline provides recommendations on how to diagnose and manage hypertension (HTN) in adults aged ≥ 19 years. Outside the scope of this guideline is the management of secondary causes of HTN,* accelerated HTN, acute HTN in emergency settings, and in pregnant adults. The amount of randomized controlled trials informing care of the elderly with raised blood pressure is limited.

For an algorithm of this guideline, refer to *Appendix A: Diagnosis and Management of Hypertension Algorithm*.

Key Recommendations†, [1]

- 140/90 or lower is the desirable blood pressure reading for an adult with no co-morbid conditions, diabetes, chronic kidney disease or other target organ damage.[2] **[Level 2, amended 2015]**
- When taking office blood pressure readings, the use of an automated office blood pressure measuring electronic device is recommended.[3] **[Level 2, new 2015]**
- Consider 24-hour ambulatory blood pressure monitoring or home blood pressure monitoring to confirm a hypertension diagnosis.[4] **[Level 1, new 2015]**
- Instigate pharmaceutical management in context of the patient's overall cardiovascular risk and not solely on their blood pressure.[5] **[Level 1, amended 2015]**
- Lifestyle management is recommended for those with mild hypertension (average blood pressure = 140 – 159/90 – 99), low-risk for cardiovascular disease and no co-morbidities.[6] **[Level 1, 2008]**

Definition

An elevated blood pressure (BP) is defined as a systolic blood pressure (SBP) > 140 mm Hg or diastolic blood pressure (DBP) > 90 mm Hg or both.

Detection

In patients aged ≥ 45 years, BP should be recorded at least once every 5 years. This recording should be the average of several measurements.

Ensure standardized technique (e.g., patient in a seated position, selecting the arm with the higher BP) and equipment are being used (refer to *Appendix B: Recommended Methods and Techniques for Measuring Blood Pressure*). When possible, use an automated office BP measuring electronic device, as an alternative to manual office BP technique.[3] Using automated office BP reduces errors due to improper technique, avoiding an overestimation of BP values (white-coat HTN) or underestimation of BP values (masked HTN).

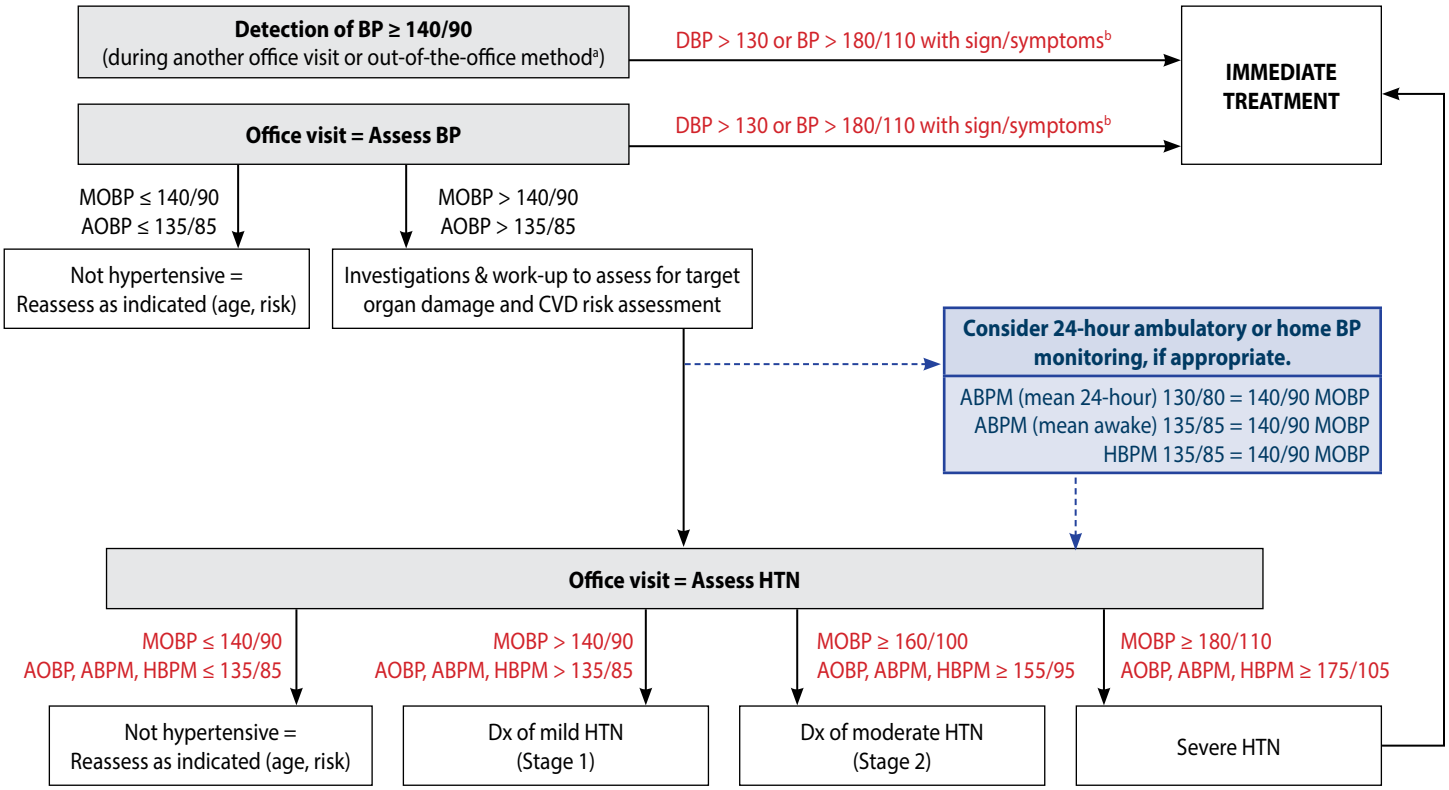
* *For some examples of secondary causes of HTN, refer to Appendix C: Examples of Secondary Causes of Hypertension.*
† *Levels of evidence are based on the 2011 Oxford Centre for Evidence-Based Medicine version.*

Diagnosis [7 - 9]

Assessment of Elevated Blood Pressure

If average BP is elevated again, proceed to investigations and work-up to assess target organ damage and cardiovascular disease (CVD) risk. Select which arm to use by measuring BP in both arms with the patient in a seated position. Measure BP three more times using the arm with the higher reading, then discard the 1st reading and average the latter two.

Figure 1. Diagnosis of hypertension algorithm



Abbreviations: AOBP = automatic office blood pressure; ABPM = ambulatory blood pressure monitoring; BP = blood pressure; CVD = cardiovascular disease; DBP = diastolic blood pressure; Dx = diagnosis; HBPM = home blood pressure monitoring; HTN = hypertension; MOBP = manual office blood pressure.
Footnote: [a] Out-of-office method may include automated BP machines at pharmacies or grocery stores. [b] Sign/symptoms may include papilloedema and retinal hemorrhage.

Investigations and work-up includes:

- Medical history - ask about risk factors and rule out any exogenous factors

  Risk Factors
  - o *Modifiable:* smoking; physical activity levels/sedentary lifestyle; poor diet; body composition (e.g., body weight, body mass index, waist circumference); poor sleep; psychological factors (e.g., stress levels).
  - o *Non-modifiable:* age; family history; ethnicity (e.g., African, Caribbean, South Asian (East Indian, Pakistani, Bangladeshi, Sri Lankan) origin).

  Exogenous Factors
  - o White-coat HTN (~20% of patients with high manual office BP readings); prescription drugs (e.g., nonsteriodal anti-inflammatory drugs (NSAIDs), steroids, oral contraceptives, decongestants); and others (e.g., alcohol, stimulants, sodium).

- Physical examination - fundoscopy, central and peripheral cardiovascular examination, and abdominal examination
- Urinalysis - albumin to creatinine ratio (ACR), hematuria
- Test for blood chemistry - potassium, sodium, creatinine/estimated glomerular filtration rate (eGFR)
- Test for type 2 diabetes - fasting blood glucose OR hemoglobin A1c level
- Test for lipids - full lipid profile
- Electrocardiogram (ECG) standard 12-lead
- CVD risk assessment - Framingham Risk Score or www.bestsciencemedicine.com/chd/calc2.html. Refer to BCGuidelines.ca: *Cardiovascular Disease – Primary Prevention*.

Consider 24-hour ambulatory or home BP monitoring for appropriate patients (e.g., suspected white-coat HTN, unusual fluctuating office-based BP readings).[4]

Table 1. Ranking of preferred methods for measuring blood pressure by accuracy and accesibility[3, 7, 10, 11]

1. Automated Office BP (e.g., BpTRU)	
135/85 (automated office BP) = 135/85 (ambulatory BP monitoring: mean awake**)**	
Advantages	1) Measurements are comparable to ambulatory BP monitoring (the gold standard); 2) readings are consistent from visit-to-visit; 3) reduces white-coat and masked HTN; and 4) correlates well with CV outcomes (e.g., acute MI and cerebrovascular events).
2. Ambulatory BP Monitoring	
130/80 (ambulatory BP monitoring: mean 24-hour) = 135/85 (ambulatory BP monitoring: mean awake) = 140/90 (manual office BP)	
Advantages	Ambulatory BP monitoring is considered the gold standard for accurate BP measurements.
Limitations	1) May cost (patient-pay ~ $50); 2) accessibility issues (both in actual devices and trained professionals to interpret results); and 3) patient may not be able to tolerate ambulatory BP monitoring.
Technical Notes	Offer ambulatory BP monitoring to patients with elevated BP and who can tolerate keeping the cuff position correctly and dry for 24 hours.
3. Home BP Monitoring	
135/85 (home BP monitoring) = 135/85 (ambulatory BP monitoring: mean awake) = 140/90 (manual office BP)	
Advantages	1) Measurements are comparable to ambulatory BP monitoring (the gold standard); 2) correlates well with target organ damage and CV mortality.
Technical Notes	Offer home BP monitoring if ambulatory BP monitoring is not tolerated. Ensure device is appropriate (e.g., cuff size) and validated (i.e., includes the endorsement logo and/or listed on www.hypertension.ca) 
4. Manual Office BP	
Advantages	1) Considered a more accurate reading for patients with arrhythmias; and 2) no accessibility issues.
Limitations	1) Known issues with the accuracy of manual office BP (e.g., white-coat effect, improper technique) that may result in approximately 10/5 mm Hg higher readings; and 2) relatively poor predictor of CV risk related to BP status.

Abbreviations: BP = blood pressure; CV = cardiovascular; HTN = hypertension; mm Hg = millimetre of mercury; MI = myocardial infarction.

Assessment of of Hypertension

If ambulatory or home BP monitoring was not conducted, measure office BP again. A HTN diagnosis may be confirmed at this visit. If a HTN diagnosis cannot be confirmed or ruled out, consider ambulatory or home BP monitoring. Further office visits may be required.

Indications for Consultation with a Specialist

Indications for consultation with a specialist include:

- Hypertensive emergency – DBP > 130 or BP > 180/110 with signs/symptoms;‡
- Sudden onset in the elderly;
- Abnormal nocturnal BP differences[12] – an extreme nocturnal BP dip (>20%), non/small nocturnal BP dip (<10%), or an increase in nocturnal BP are at risk for CVD;
- Signs or symptoms suggesting of secondary causes of the HTN; and
- Resistant HTN – BP still difficult to control after treating with 3 antihypertensive medications.

‡ For more information on difference between hypertensive urgency and emergency, refer to www.rxfiles.ca/rxfiles/uploads/documents/Hypertensive-Urgency-Management.pdf

Management

Once a diagnosis has been confirmed, conduct a patient-specific discussion to decide upon desirable BP readings and an individualized treatment plan. This discussion should consider any benefits and potential harms.

Desirable Blood Pressure Readings

140/90 or lower is the desirable blood pressure reading for an adult with no-comorbid conditions, diabetes, chronic kidney disease or other target organ damage.[2] However, an individual patient's desirable BP is influenced by their age, presence of target organ damage, CVD risk level and/or the presence of other CVD risk factors (refer to BCGuidelines.ca: *Cardiovascular Disease – Primary Prevention*).

This guideline uses the term 'desirable BP' instead of 'targets' to encourage clinical judgement when dealing with an individual patient. The suggested desirable BP readings of 140/90 is provided as guidance only, since recommending a uniform threshold for all patients or even patient groups is not optimal. Also, the term 'targets' is not used because the treat-to-target approach is not recommended.

Controversies in Care: Blood Pressure Readings in the Diabetes Population

This guideline recommends a desirable BP reading of 140/90 for the diabetes population. There is an acknowledgement that this does not align with the Canadian Hypertension Education Program's[7] or the Canadian Diabetes Association's[12] recommendation of a 130/80 target; but it does align with the Eighth Joint National Committee's[9] and National Institute for Health and Care Excellence's[8] guidance. The target of 130/80 is not supported by any randomized controlled trials, and therefore is mostly consensus based. However, there is no evidence to completely discard the 130/80 either. A desirable BP of 140/90 is based on a recent large clinical trial[2] that found no significant difference between a target of 140/90 versus 120/80, thus a 130/80 would unlikely be beneficial versus 140/90. Future trials are needed to bring clarity to this issue.

Lifestyle Management

Recommend lifestyle management for patients with mild HTN (average BP = 140 – 159/90 – 99), low-risk for CVD and no co-morbidities (refer to Table 3 for list of co-morbidities).[6]

The benefits of pharmacologic treatment in the mild HTN group is unknown, and may not outweigh the potential harms (e.g., increased risk of falls).[14] In a recent systematic review, pharmaceutical treatment within this patient group did not reduce total mortality, total CV events, coronary heart disease or stroke, when compared to a placebo treatment.[14] Whereas, the benefits of lifestyle management (e.g., smoking cessation, increasing physical activity, obtaining or maintaining a healthy body composition, eating a well-balanced diet, and monitoring salt intake) with this patient group has been documented (refer to Table 3). For more information, refer to BCGuidelines.ca: *Lifestyle & Self-Management Supplement*.

Table 2. Impact of health behaviours on blood pressure[7, 8]

Intervention	*SBP (mm Hg)*	*DBP (mm Hg)*	Goal
Diet and weight control	-6.0	-4.8	• BMI < 25 kg/m^2; WC ≤ 102/88 cm (Caucasian men/women), ≤ 90/80 cm (Asian men/women)
Reduced salt/sodium intake	-5.4	-2.8	• < 2000 mg of sodium[a]
Reduced alcohol intake (heavy drinkers)	-3.4	-3.4	• ≤ 2 drinks/day
DASH diet[b]	-11.4	-5.5	-
Physical activity	-3.1	-1.8	• 30-40 minutes 4-7 days/week
Smoking cessation	unknown	unknown	• Smoke free environment
Relaxation therapies	-3.7	-3.5	-
Multiple interventions	-5.5	-4.5	-

Abbreviations: BMI = body mass index; DASH = dietary approaches to stop hypertension; DBP = diastolic blood pressure; kg/m^2 = kilogram per square metre; mm Hg = millimetre of mercury; SBP = systolic blood pressure; WC = waist circumference.
Footnotes: [a] Canadian Hypertension Education Program now recommends a sodium intake threshold 2000 mg (5 g of salt) per day. The previous threshold was ≤ 1500 mg (3.75 g of salt) and was changed based on clinical trial evidence from two systematic reviews published in 2013. The aim is to identify salt sensitive patients. [b] There are no mortality outcome studies of the DASH diet.

Pharmacologic Management[7]

Instigate pharmacologic management in context of the patient's overall CVD risk (e.g., not solely based on a patient's BP) and in conjunction with lifestyle management.[5] Pharmacologic management may be considered if:

1) average BP is > 140/90 and with target organ damage or CVD risk >20%;
2) average BP is > 140/90 with 1+ co-morbidities (refer to Table 3 for co-morbidities list);
3) average BP is ≥ 160/100; or
4) desirable BP is not reached with lifestyle management.

Table 3. Pharmacologic treatment recommendations of hypertension complicated by co-morbidity[7]

Co-morbidity	*Pharmacologic Treatment Recommendations*		Notes
Cardiovascular Disease			
Coronary heart disease	First-line	**ACE-I** *or* **ARB** *or* **Beta-blockers** (for patients with stable angina)	1) Do not use short-acting nifedipine; 2) Do not use ACE-I + ARB if no systolic HF; 3) Caution when lowering SBP to a goal, if DBP is ≤ 60 mm Hg.
	Second-line	**Long-acting CCB** *or* **DHP-CCB** (for high-risk patients and in combination with a first-line ACE-I)	
Myocardial infarction (recent)	First-line	**Beta-blockers + ACE-I/ARB** (if ACE-I intolerant)	1) Do not use non-DHP-CCB (diltiazem, verapamil) if heart failure is present. 2) Caution when lowering SBP to a goal, if DBP is ≤ 60 mm Hg.
	Second-line	**Long-acting CCB** (if beta-blockers contraindicated or ineffective)	
Left ventricular hypertrophy	First-line	**ACE-I/ARB** (if ACE-I intolerant) *or* **Thiazide/Thiazide-like diuretic** *or* **Long-acting CCB**	Do not use direct arterial vasodilators such as hydralazine and minoxidil.
	Second-line	Combination of first-line drugs.	
Heart failure	First-line	**Beta-blockers + ACE-I/ARB** (if ACE-I intolerant) • Aldosterone antagonist may be added in patients with recent CV hospitalization, acute MI, elevated BNP or NT-proBNP level, or NYHA Class II to IV symptoms.	1) If combining aldosterone antagonist to ACE-I/ARB, monitor for hyperkalemia. 2) If combining ACE-I + ARB, monitor for potential adverse events including hypotension, hyperkalemia and worsening of renal function. 3) If bradycardia is also present, avoid use of beta-blockers.
	Second-line	**ACE-I + ARB** *or* **Hydralazine + Isosorbide dinitrate** (if ACE-I + ARB intolerant or contraindicated) • Thiazide/thiazide-like for BP control or loop diuretics for volume control as additive therapy. DHP-CCB may also be used.	
Cerebrovascular disease After acute stroke	First-line	**ACE-I + Thiazide/Thiazide-like diuretic**	1) During acute stroke and not eligible for thrombolytic therapy do not treat HTN unless extreme BP increase. 2) Combination of ACE-I + ARB is not recommended.
	Second-line	**Long-acting DHP-CCB** *or* combination of additional drugs	
Diabetes			
Diabetes with microalbuminuria[b], CKD, CVD or CVD risk factors	First-line	**ACE-I/ARB** (if ACE-I intolerant)	Loop diuretic could be considered in hypertensive CKD patients with extracellular fluid volume overload.
	Second-line	**DHP-CCB**	
Diabetes	First-line	**ACE-I** *or* **ARB** *or* **Thiazide/Thiazide-like diuretic** *or* **DHP-CCB**	
	Second-line	Combination of first-line drugs • In combination with ACE-I or ARB, a DHP-CCB is preferable to a thiazide/thiazide-like diuretic.	
Chronic Kidney Disease			
Chronic kidney disease without diabetes	First-line	**ACE-I/ARB** (if ACE-I intolerant) • Thiazide/thiazide-like diuretic as additive therapy. Loop diuretics for those with volume overload.	1) If using ACE-I or ARB, monitor renal function and potassium. 2) Combination of ACE-I + ARB is not recommended for patients without proteinuria[a].
	Second-line	Combination of additional drugs	
Renovascular disease	First-line	**Thiazide diuretic** *or* **ACE-I or ARB** (if ACE-I intolerant) *or* **Long-acting CCB**	Avoid ACE-I or ARB if bilateral renal artery stenosis or unilateral disease with solitary kidney.
	Second-line	Combination of first-line drugs	

Abbreviations: ACE-I = angiotensin-converting enzyme inhibitors; ACR = albumin to creatinine ratio; ARB = angiotensin II receptor blocker; BP = blood pressure; BNP = brain natriuretic peptide; CCB = calcium channel blocker; CKD = chronic kidney disease; CV = cardiovascular; CVD = cardiovascular disease; DBP = diastolic blood pressure; DHP = dihydropyridine; HF = heart failure; HTN = hypertension; MI = myocardial infarction; mm Hg = millimeter of mercury; NYHA = New York Heart Association functional classification system; NT-proBNP = N-terminal prohormone of brain natriuretic peptide; SBP = systolic blood pressure.
Footnotes: [a] Proteinuria is defined as urinary protein > 500 mg/24hr or ACR >30 mg/mmol in 2 of 3 specimens. [b] The term microalbuminuria is being phased out, which is now referred to as moderately increased albuminuria and as defined as ACR = 3 mg/mmol - 30 mg/mmol.

Treatment of Hypertension without Specific Indications

In general, antihypertensive medications are equally effective in lowering BP. When prescribing one, take into account cost of the drug, any side-effects and any potential contraindications. For a list of commonly prescribed antihypertensive medications in each class, refer to *Appendix D: Commonly Used Antihypertensive Drugs*.

Without specific indications, consider monotherapy with one of the following first-line drugs:

- thiazide diuretic;
- long-acting calcium channel blocker (CCB);
- angiotensin converting enzyme inhibitor (ACE-I; in non-black patients); or
- angiotensin II receptor blocker (ARB).

Among these, thiazide diuretics are the least costly agents. Although hydrochlorothiazide (12.5 to 25 mg daily) is the more commonly prescribed thiazide diuretic for monotherapy, outcome studies[15, 16] suggested that it may be inferior to chlorthalidone (12.5 to 25 mg daily) in reducing CV events (e.g., non-fatal myocardial infarction, stroke, or death).[17] However, chlorthalidone poses a slightly higher risk of hypokalemia (7-8%) than hydrochlorothiazide, even at low doses.[18]

Note that alpha-blockers are no longer considered to be a first-line option. Beta-blockers are not a preferred first-line drug but may be used for patients aged < 60 years old and those with specific indications (e.g., stable angina).

If desirable BP is not achieved with standard-dose monotherapy, use combination therapy by adding one or more of the first-line drugs. Combination of ACE-I and ARB is not recommended, and caution with combining a non-dihydropyridine CCB (i.e., verapamil or diltiazem) and a beta-blocker.

Treatment of Hypertension with Specific Indications

Selecting an antihypertensive drug for a patient with 1+ co-morbidities may require a specific first-line drug. Refer to Table 3 for recommended first-line and second-line treatments.

Follow-up to Treatment

Two weeks after instigating antihypertensive medications, follow-up with an eGFR to monitor kidney function. Then, follow-up with the patient at monthly intervals until BP is in a desired range for two consecutive visits. Review every 3 – 6 months (as long as the patient remains stable). Establish the minimum dose of medication required to achieve the desired BP. Periodically, consider discontinuing or reducing antihypertensive medications to assess the appropriate level of pharmacologic management. Monitor kidney function whenever medications are changed (e.g., dose adjustments).

Ongoing Care

Implement self-management strategies to assist the patient in managing their BP. At least annually, review the patient's risk factors, examine for evidence of target organ damage, and check eGFR and ACR.

Resources

References

1. OCEBM Levels of Evidence Working Group. The Oxford 2011 Levels of Evidence. Oxford Centre for Evidence-Based Medicine. Available at: www.cebm.net
2. Cushman WC, Evans GW, Byington RP, et al. ACCORD Study Group. Effects of intensive blood-pressure control in type 2 diabetes mellitus. N Engl J Med. 2010;362(17):507-515.
3. Myers MG, Kaczorowski J, Dawes M, et al. Automated office blood pressure measurement in primary care. Can Fam Physician. 2014;60:127-32.
4. Hodgkinson J, Mant J, Martin U, et al. Relative effectiveness of clinic and home blood pressure monitoring compared with ambulatory blood pressure monitoring in diagnosis of hypertension: Systematic review. BMJ (Clinical Research Ed.) 2011;342, d3621.
5. The Blood Pressure Lowering Treatment Trialists' Collaboration. Blood pressure-lowering treatment based on cardiovascular risk: A meta-analysis of individual patient data. Lancet. 2014;384:591-98.
6. Dickinson HO, Mason JM, Nicolson DJ, et al. Lifestyle interventions to reduce raised blood pressure: A systematic review of randomized controlled trials. J Hypertens. 2006;24(2),215–233.
7. Dasgupta K, Quinn RR, Zarnke KB, et al. The 2014 Canadian Hypertension Education Program recommendations for blood pressure measurement, diagnosis, assessment of risk, prevention and treatment of hypertension. Can J Cardiol. 2014;30:485-501.
8. National Institute for Health and Care Excellence. Hypertension: The clinical management of primary hypertension in adults (Clinical Guidance 127). 2011. London: National Institute for Health and Care Excellence.
9. James PA, Oparil S, Carter BL, et al. 2014 evidence-based guideline for the management of high blood pressure in adults: Report from the panel members appointed to the Eighth Joint National Committee (JNC 8). JAMA. doi:10.1001/jama.2013.284427.
10. Myers MG, Godwin M, Dawes M, et al. Measurement of blood pressure in the office: Recognizing the problem and proposing the solution. Hypertension. 2010;55:195-200.
11. Kaczorowski J, Dawes M, Gelfer M. Measurement of blood pressure: New developments and challenges. BCMJ. 2012;54(8):399-403.
12. Fagard RH. Dipping pattern of nocturnal blood pressure in patients with hypertension. Expert Rev Cardiovasc Ther. 2009;7(6):599-605.
13. Canadian Diabetes Association Clinical Practice Guidelines Expert Committee, Gilbert R, Rabi D, LaRochelle P, et al. Treatment of hypertension. Can J Diabetes. 2013;37 Suppl 1: S117-8.

14. Diao D, Wright JM, Cundiff DK, et al. Pharmacotherapy for mild hypertension. Cochrane Database Syst Rev. 2012;8:CD006742.
15. Dorsch MP, Gillespie BW, Erickson SR, et al. Chlorthalidone reduces cardiovascular events compared with hydrochlorothiazide: A retrospective cohort analysis. Hypertension. 2011; 57(4):689–94.
16. Roush GC, Holford TR, Guddati AK. Chlorthalidone compared with hydrochlorothiazide in reducing cardiovascular events: Systematic review and network meta-analyses. Hypertension. 2012;59(6):1110–17.
17. Messerli FH, Makani H, Benjo A, et al. Antihypertensive efficacy of hydrochlorothiazide as evaluated by ambulatory blood pressure monitoring: A meta-analysis of randomized trials. JACC. 2011;57(5):590-300.
18. The ALLHAT Officers and Coordinators for the ALLHAT Collaborative Research Group. Major outcomes in high-risk hypertensive patients randomized to angiotensin-converting enzyme inhibitor or calcium channel blocker vs diuretic: The Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial (ALLHAT). JAMA. 2002;288(23):2981-2196.
19. Franse LV, Pahor M, Di Bari M, et al. Hypokalemia associated with diuretic use and cardiovascular events in the Systolic Hypertension in the Elderly Program. Hypertension. 2000;35(5):1025-1030.

Resources

For Physicians:

- **RACE** - Rapid Access to Consultative Expertise program, a telephone advice line from a selection of specialty services for general practitioners.
    - For Vancouver Coastal Health Region - www.raceconnect.ca or by telephone 604-696-2131 (Vancouver area) or 1-877-696-2131 (toll free); Monday to Friday, 8 am to 5 pm.
    - For Northern Health - www.northernpartnersincare.ca/northernrace/ or by telephone 1-877-605-7223
- **CHEP** - Canadian Hypertension Education Program, www.hypertension.ca/en/chep
- **BHS** - British Hypertension Society, www.bhsoc.org/
- **BC Guidelines** - www.BCGuidelines.ca
    - *Cardiovascular Disease – Primary Prevention*
    - *Lifestyle & Self-Management Supplement*

Appendices

- Appendix A: Diagnosis and Management of Hypertension Algorithm
- Appendix B: Recommended Methods and Techniques for Measuring Blood Pressure
- Appendix C: Examples of Secondary Causes of Hypertension
- Appendix D: Commonly Used Antihypertensive Drugs

Associated Documents

The following documents accompany this guideline:

- Summary of Guideline: Hypertension – Diagnosis and Management
- A Guide for Patients: Diagnosis of Hypertension
- A Guide for Patients: Management of Hypertension

This guideline is based on scientific evidence current as of the Effective Date.

This guideline was developed by the Guidelines and Protocols Advisory Committee, approved by the British Columbia Medical Association, and adopted by the Medical Services Commission.

THE GUIDELINES AND PROTOCOLS ADVISORY COMMITTEE

The principles of the Guidelines and Protocols Advisory Committee are to:

- encourage appropriate responses to common medical situations
- recommend actions that are sufficient and efficient, neither excessive nor deficient
- permit exceptions when justified by clinical circumstances

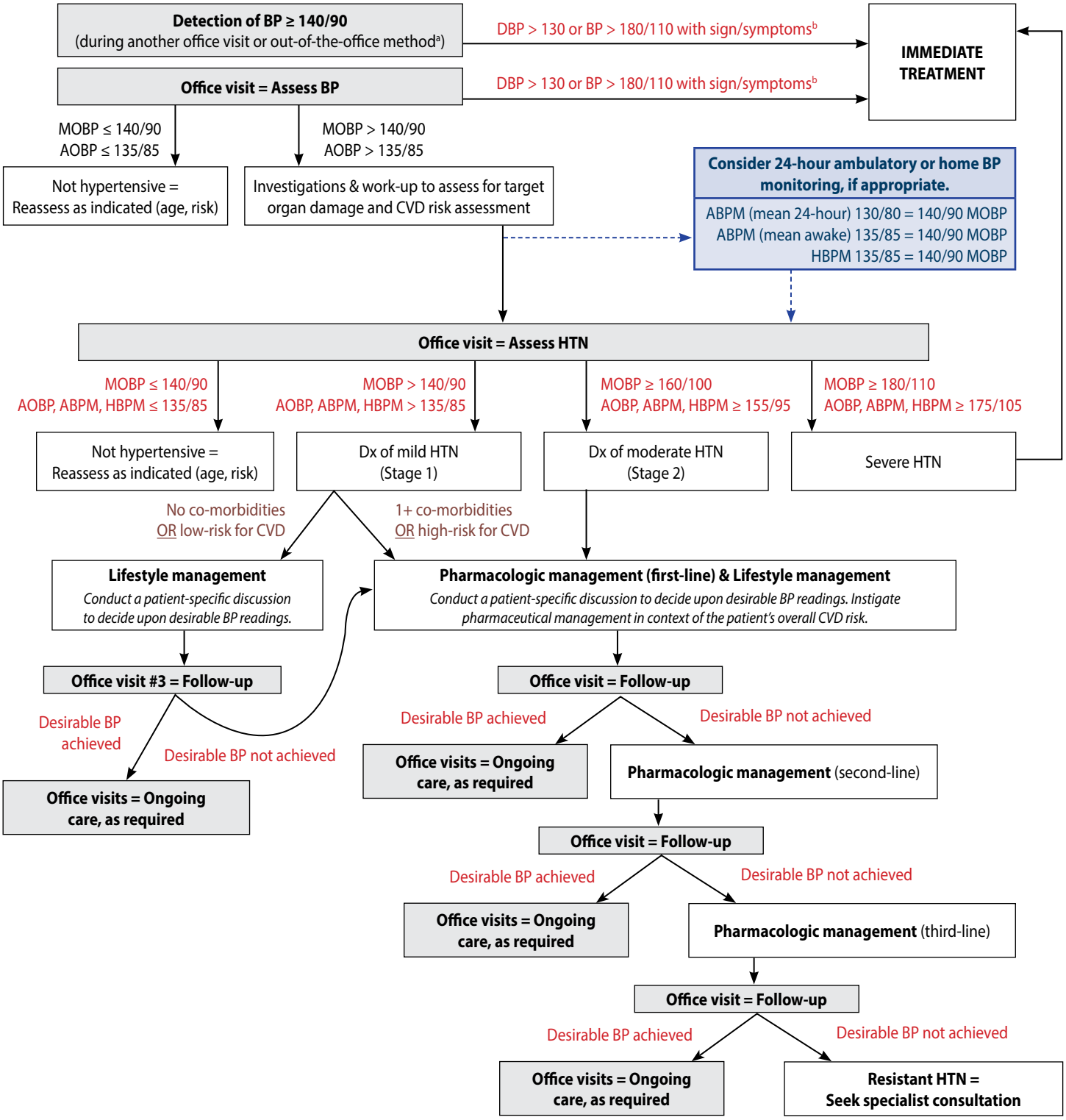
Contact Information:

Guidelines and Protocols Advisory Committee
PO Box 9642 STN PROV GOVT
Victoria BC V8W 9P1

Email: hlth.guidelines@gov.bc.ca
Website: www.BCGuidelines.ca

Disclaimer

Appendix A: Diagnosis and Management of Hypertension Algorithm



Abbreviations: AOBP = automatic office blood pressure; ABPM = ambulatory blood pressure monitoring; BP = blood pressure; CVD = cardiovascular disease; DBP = diastolic blood pressure; Dx = diagnosis; HBPM = home blood pressure monitoring; HTN = hypertension; MOBP = manual office blood pressure.

Footnote: [a] Out-of-office method may include automated BP machines at pharmacies or grocery stores. [b] Sign/symptoms may include papilloedema and retinal hemorrhage.

Appendix B: Recommended Methods and Techniques for Measuring Blood Pressure

Recommended Methods for Measuring Blood Pressure

In the office setting, the use of automated office blood pressure (BP) electronic device, which averages multiple readings, is recommended as an alternative to taking a manual office BP.[1] The advantages of automated office BP measurements (e.g., BpTRU, Omron HEM-907, Microlife WatchBP Office) include: 1) BP measurements are comparable to ambulatory BP monitoring (considered the gold standard); 2) readings are consistent from visit-to-visit; 3) reduces white-coat and masked hypertension (HTN); and 3) correlates well with cardiovascular (CV) outcomes (e.g., acute myocardial infarction, cerebrovascular events). However, manual office BP may be appropriate in cases for patients with arrhythmias.

Table 1. Comparison of measurement equivalence numbers

Method	Automated Office BP	Ambulatory BP Monitoring (mean 24-hour)	Ambulatory BP Monitoring (mean awake)	Home BP Monitoring	Manual Office BP
Measurements (mm Hg)	135/85	130/80	135/85	135/85	140/90

Abbreviations: BP = blood pressure; mm Hg = millimetre of mercury.

When confirming a HTN diagnosis, consider a 24-hour ambulatory or home BP monitoring for appropriate patients (e.g., suspected white-coat HTN, unusual fluctuating office-based BP readings).[2] Even though ambulatory BP monitoring is considered the gold standard for accurate BP measurements, there are some known limitations including: 1) may cost (patient-pay ~ $50); 2) accessibility issues (both in actual devices and trained professionals to interpret results); and 3) patient may not be able to tolerate ambulatory BP monitoring device. Home BP measurements are comparable to ambulatory BP measurement and may be used if ambulatory BP monitoring is not tolerated or available. Ambulatory and home BP monitoring may also have a role in the management of HTN, including determining the efficacy of antihypertensive drugs or assessing resistant HTN.

Both the method used and the presence of any errors (refer to Table 2) may lead to a misdiagnosis and/or treatment decisions. When comparing common manual office BP practices versus proper standardized technique measurements, the mean manual office BP was at least 10/5 mm Hg higher.[1] As well, manual office BP was consistently higher than the recognized 5 mm Hg difference when compared to mean ambulatory BP monitoring (awake).[3]

Table 2. Common errors in when measuring blood pressure[1, 4]

Type of Error	% Affect	Notes
Natural variation	≥ 14%	• After 2 office visits, a patient with a true systolic BP of 130 mm Hg will have a 14% chance of an average above 140 mm Hg. After 10 visits, the risk of this average (and potential misdiagnosis) increases to 64%. In healthy adults < 35 years, the probability of misclassification exceeds that of accurate diagnosis.
Incorrect measurement technique	> 60%	• 63% of physicians and nurses were found to be out of range in BP measurement (false increases or reductions); none followed the American Heart Association's technique recommendations. • When comparing common MOBP practices to proper technique, the mean MOBP was at least 10/5 mm Hg higher than the proper technique.
White-coat HTN	20%	• More common in elderly patients and is generally associated with a relatively benign prognosis. • Physicians consistently obtain higher readings than nurses.
Office-based measurement	~ 100%	• An AOBP measurement, which averages multiple readings, is superior to MOBP in the office setting.
CVD risk not assessed	~ 100%	• Patients with CVD or are high-risk for CVD are approached the same as low-risk patients.

Abbreviations: ABPM = ambulatory blood pressure monitoring; AOBP = automated office blood pressure; BP = blood pressure; CVD = cardiovascular disease; HTN = hypertension; MOBP = manual office blood pressure; mm Hg = millimetre of mercury.

Techniques for Measuring Blood Pressure[5]

Office Blood Pressure Measurement

Equipment Requirements

- Ensure appropriate equipment is being used (e.g., accurate sphygmomanometer, calibrated and validated electronic devices, cuff with an appropriate bladder size).

Patient Requirements

- Patient has rested comfortably for 5 minutes in a seated position, legs uncrossed and a supported bare arm.
- For elderly and diabetic patients, BP may be measured in a supine position.

Arm Selection

- Select which arm to be used by measuring both arms with the BP cuff at heart level. Use the arm with the higher BP for future measurement and interpretation.

Taking Measurements

- For AOBP: Set the device to take measurements at 1 or 2 minute intervals. Discard the 1st reading and average the latter readings.
- For auscultation:
    - o Take 3 measurements, with at least one minute should elapse between readings. Discard the 1st reading and average the latter 2 readings.
    - o Increase the pressure rapidly to 30 mm Hg above the level at which the radial pulse is extinguished.
    - o Place the bell or diaphragm of the stethoscope gently and steadily over the brachial artery.
    - o 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.
    - o 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.
- For those with an arrhythmia: additional readings with auscultation may be required to estimate the average systolic and diastolic pressure.

Results

- Record BP to the closest 2 mm Hg (for manual office BP) or 1 mm Hg (for automated office BP); which arm was used; position of patient (i.e., supine, sitting or standing); and heart rate.
- A mean 24-hour ambulatory BP monitoring 130/80 equates to an automated office BP 135/85 and a manual office BP of 140/90 mm Hg.

Ambulatory Blood Pressure Monitoring Measurement

Equipment Requirements

- Ensure ambulatory BP monitoring device has been validated independently using established protocols. A list of validated devices is listed at: www.bhsoc.org/index.php?cID=247.

Patient Requirements

- Ensure the patient is able to tolerate ambulatory BP monitoring (e.g., keeping cuff in correct position and dry) and is willing to keep a diary of events (e.g., when medication(s) were taken, bedtime).

Taking Measurements

- Have the device take 2 measurements per hour during the patient's daytime (i.e., awake) hours. Record the average BP from at least 14 measurements.

Results

- A mean 24-hour ambulatory BP monitoring 130/80 equates to a mean awake ambulatory BP monitoring 135/85 and a manual office BP of 140/90 mm Hg.
- Any changes in nocturnal BP should be taken into account with any decisions to prescribe or withhold drug therapy. This is because a decrease in nocturnal BP of less than 10% is associated with increased risk of CV events.

Resources

- Ambulatory BP monitoring Educational Resource Video for healthcare professionals from the British Hypertension Society (BHS), www.youtube.com/watch?v=ddwXm0HjdpI&feature=youtu.be.

Home Blood Pressure Monitoring Measurement

Equipment Requirements

- Ensure home BP monitoring device has been validated independently and is calibrated. A list of validated devices is listed on Hypertension Canada's website: www.hypertension.ca and have the endorsement logo on their package.

Patient Requirements

- Ensure patient is well suited (e.g., does not have arrhythmia or experiences undue anxiety) and is capable of implementing proper technique (e.g., using proper cuff size being relaxed, seated position, reasonable amount of time after heavy physical activity, drinking coffee or smoking).

Taking Measurements

- Have the patient take 2 consecutive (at 1 minute intervals) measurements once in the morning and once in the evening for 4 – 7 days. Discard 1st day of measurements, and average the remaining measurements.

Results

- A home BP monitoring 135/85 equates to a mean awake ambulatory BP monitoring 135/85 and a manual office BP 140/90 mm Hg.

References

1. Myers MG, Kaczorowski J, Dawes M, et al. Automated office blood pressure measurement in primary care. Can Fam Physician. 2014;60:127-32.
2. Hodgkinson J, Mant J, Martin U, et al. Relative effectiveness of clinic and home blood pressure monitoring compared with ambulatory blood pressure monitoring in diagnosis of hypertension: Systematic review. BMJ (Clinical Research Ed.). 2011;342, d3621.
3. Myers MG, Godwin M, Dawes M, et al. Measurement of blood pressure in the office: Recognizing the problem and proposing the solution. Hypertension. 2010;55:195-200.
4. Martin SA, Boucher M, Wright JM, et al. Mild hypertension in people at low risk. BMJ. 2014;349:g5432 doi:10.1136/bmj.g5432.
5. Dasgupta, K, Quinn RR, Zarnke KB, et al. The 2014 Canadian Hypertension Education Program recommendations for blood pressure measurement, diagnosis, assessment of risk, prevention and treatment of hypertension. Can J Cardiol. 2014;30:485-501.

Appendix C: Examples of Secondary Causes of Hypertension

Indications for a secondary cause of hypertension are: 1) severe or refractory hypertension; 2) an acute rise over previously stable values; 3) age < 30 years without family history; and/or 4) no nocturnal fall in blood pressure (BP) on during a 24-hour ambulatory BP monitoring period.

Table 1. Examples of identifiable secondary causes of hypertension and initial investigations

Aldosteronism (Primary)	
Signs/symptoms: • Spontaneous hypokalemia (though more than one-half of patients are normokalemic) • Profound diuretic-induced hypokalemia (< 3.0 mmol/L) • Hypertension refractory to treatment with 3 or more drugs • Hypertension and adrenal incidentaloma	*Initial Investigations:* • Plasma renin activity and plasma aldosterone concentration Note: ideally measured before 10 am after 1 hour of ambulation, if possible. Patient should be on an unrestricted salt diet. Certain medications affect aldosterone and renin. If safe, suggested drug-free periods prior to testing are: o Beta-blockers = 1 week o ACE-I, ARB, diuretics, NSAIDs = 2 weeks o Spironolactone, eplerenone, amiloride, triamterene, potassium-wasting diuretics = 4 weeks.
Sleep Apnea	
Signs/symptoms: • Loud snoring • Daytime somnolence and fatigue	*Initial Investigations:* • Sleep diary • Overnight oximetry
Renovascular Disease	
Signs/symptoms: • ↑> 30% creatinine after introducing angiotensin converting enzyme inhibitor (ACE-I) or angiotensin II receptor blocker (ARB) • Hypertension with diffuse atherosclerosis or an unilateral small kidney • Episodes of flash pulmonary edema • Abdominal bruit (not very sensitive)	*Initial Investigations may include:* • Magnetic resonance angiography (MRA) • Computed tomography angiography (CTA)
Kidney Disease (Primary)	
Signs/symptoms: • ↓ estimated glomerular filtration rate (eGFR) and/or abnormal urinalysis Refer to BCGuidelines.ca – *Chronic Kidney Disease – Identification, Evaluation and Management of Adult Patients.*	*Initial Investigations:* • eGFR • Urinalysis - albumin to creatinine ratio (ACR), hematuria • Physical exam & medical history • Renal ultrasound
Cushing's Syndrome	
Signs/symptoms: • Cushingoid facies • Central obesity • Proximal muscle weakness • Ecchymoses	*Initial Investigations may include any of:* • late-night salivary cortisol levels • 24-hour urine free cortisol (UFC) • low-dose (1-mg overnight or 48-hour [2-mg/24-hour]) dexamethasone suppression test (LDDST)

Pheochromocytoma	
Signs/symptoms: • Paroxysmal elevations in BP • Headache • Palpitations • Sweating	*Initial Investigations:* • 24-hour urine for catecholamines and metanephrinesn Note: False positives can be caused by tricyclic antidepressants, antipsychotics, levodopa, decongestants, labetalol, sotalol, buspirone, ethanol, acetaminophen, phenoxybenzamine, withdrawal from clonidine (and other drug withdrawal) and major physical stress (e.g., surgery, stroke, sleep apnea).
Oral Contraceptives	
Signs/symptoms: • ↑ BP temporally related to oral contraceptive use	*Initial Investigations:* –
Coarctation of the Aorta	
Signs/symptoms: • ↑ BP in right arm with diminished or delayed femoral pulses, and low BP in the legs	*Initial Investigations:* • Echocardiogram Note: most occur just distal to the left subclavian origin.
Hypo/Hyperthyroidism	
Signs/symptoms: Refer to BCGuidelines.ca – *Thyroid Function Tests in the Diagnosis and Monitoring of Adults.*	*Initial Investigations:* • Thyroid-stimulating hormone (TSH)
Hyperparathyroidism	
Signs/symptoms: • Bone pain • Non-specific symptoms • Patients often asymptomatic	*Initial Investigations:* • Parathyroid hormone (PTH) • Ionized calcium • Phosphate

Appendix D: Commonly Used Antihypertensive Drugs [1-4, a]

Generic Name (trade name) (strengths and dosage form)	Usual Adult Dosages for Hypertension[b]	Annual Cost[c]	PharmaCare Coverage	Common Adverse Effects	Therapeutic Considerations
Thiazide Diuretics					
chlorthalidone (G) (Tabs: 50, 100 mg)	**Initial**: 12.5 mg daily **Usual**: 12.5-25 mg daily	$12-25	Regular Coverage	Common • Hypotension, muscle cramps, weakness, erectile dysfunction • Hypokalemia, hyponatremia, hyperglycemia, hyperlipidemia, hyperuricemia Less Common • Allergic reactions (cross sensitivity to other sulfonamide derivatives), photosensitivity, fatigue, blood dyscrasias, azotemia	• Monitor SCr and potassium. • Generally ineffective in CrCl < 30 mL/min. • Use cautiously in patients with history of or predisposition to gout (may precipitate gout) or renal impairment (cumulative effects may develop). • May change glycemic control in patient with diabetes or prediabetes. • Consider an alternative antihypertensive for patients with or predisposed to arrhythmias
hydrochlorothiazide (G) (Tabs: 12.5, 25, 50, 100 mg)	**Initial**: 12.5 mg daily **Usual (as monotherapy)**: 12.5 mg to 50 mg once daily **Usual (as adjunctive therapy)**: 12.5 mg to 25 mg once daily **Maximum**: 50 mg daily (some sources recommend maximum 25 mg daily)	$12-13	Regular Coverage		
indapamide (Lozide, G) (Tabs: 1.25, 2.5 mg)	**Initial**: 1.25 mg once daily **Usual (as monotherapy)**: 2.5 mg once daily **Usual (as adjunctive therapy)**: 1.25 mg to 2.5 mg once daily **Maximum**: 5 mg daily (some sources recommend maximum 2.5 mg daily)	$29-93	Limited Coverage		
Angiotensin-Converting Enzyme Inhibitor (ACE-I)					
ramipril (Altace, G) (Caps: 1.25, 2.5, 5, 10, 15 mg)	**Initial**: 2.5 mg once daily **Usual**: 2.5 to 10 mg once daily **Maximum**: 20 mg daily	$58-147	Regular Coverage RDP, Reference Drug	Common • Dry cough • Hyperkalemia Less Common • Angioedema • Precipitation of renal failure in patients with renovascular disease, volume depletion or concomitant NSAID use	• Monitor SCr and potassium at initiation of therapy and periodically. • Reduce initial dose by 50% if on concomitant diuretics (risk of hypotension with hypovolemia). • Cough associated with ACE-I is dry, hacking and non-productive and typically occurs within months of initiation of therapy. • Risk factors for hyperkalemia include renal dysfunction, diabetes and concomitant use of potassium supplements, potassium-sparing diuretics or potassium-containing salts. • Consider a thiazide diuretic or CCB instead of an ACE-I or ARB as initial antihypertensive therapy in black patients. • Contraindicated in pregnancy. • For patients who experience reduced antihypertensive effect near the end of the 24-hour dosing interval, divide total daily dose into two equal doses given every 12 hours or increase once daily dose.
captopril (Capoten, G) (Tabs: 6.25, 12.5, 25, 50, 100 mg tablet)	**Initial**: 12.5-25 mg BID to TID **Usual**: 50 mg BID to TID **Maximum**: 450 mg daily *Administer one hour prior to meals*	$125-922	Partial Coverage RDP		
cilazapril (Inhibace, G) (Tabs: 1, 2.5, 5 mg)	**Initial**: 2.5 mg once daily **Usual**: 2.5 to 5 mg once daily **Maximum**: 10 mg daily	$71-164	Partial Coverage RDP		
quinapril (Accupril, G) (Tabs: 5, 10, 20, 40 mg)	**Initial**: 10 mg once daily **Usual**: 10 to 20 mg once daily **Maximum:** 40 mg daily	$359	Partial Coverage RDP		
trandolapril (Mavik) (Caps: 0.5, 1, 2, 4 mg)	**Initial**: 1 mg once daily **Usual**: 1 to 2 mg once daily **Maximum**: 4 mg daily	$264-374	Partial Coverage RDP		
benazepril (Lotensin, G) (Tabs: 5, 10, 20 mg)	**Initial**: 10 mg once daily **Usual**: 20 mg once daily **Maximum:** 40 mg daily	$265-304	Partial Coverage RDP		
enalapril (Vasotec, G) (Tabs: 2.5, 5, 10, 20 mg)	**Initial**: 5 mg once daily **Usual**: 10 mg to 40 mg daily as a single dose or two divided doses **Maximum**: 40 mg daily	$243-485	Partial Coverage RDP		
fosinopril (Monopril, G) (Tabs: 10, 20 mg)	**Initial**: 10 mg once daily **Usual**: 20 mg once daily **Maximum:** 40 mg daily	$243-485	Partial Coverage RDP		
lisinopril (Prinivil, Zestril, G) (Tabs: 5, 10, 20 mg)	**Initial**: 10 mg once daily **Usual**: 10 to 40 mg once daily **Maximum:** 80 mg daily	$243-970	Partial Coverage RDP		
perindopril (Coversyl, G) (Tabs: 2, 4, 8 mg)	**Initial**: 4 mg once daily **Usual**: 4 to 8 mg once daily **Maximum**: 8 mg daily	$243	Partial Coverage RDP		

Generic Name (trade name) (strengths and dosage form)	Usual Adult Dosages for Hypertension[b]	Annual Cost[c]	PharmaCare Coverage	Common Adverse Effects	Therapeutic Considerations
Angiotensin II Receptor Blockers (ARB)					
candesartan (Atacand, G) (Tabs: 4, 8, 16, 32 mg)	**Initial**: 8 mg once daily **Usual**: 8 to 16 mg once daily **Maximum**: 32 mg daily	$112	Limited Coverage, Regular Coverage RDP, Reference Drug	Common • Hyperkalemia Less Common • Angioedema • Precipitation of renal failure in patients with renovascular disease, volume depletion or concomitant NSAID use	• Monitor SCr and potassium at initiation of therapy and regularly. • Reduce initial dose if using concomitant diuretics (risk of hypotension with hypovolemia). • Risk factors for hyperkalemia include renal dysfunction, diabetes and concomitant use of potassium supplements, potassium-sparing. diuretics or potassium-containing salts • Consider a thiazide diuretic or CCB instead of an ACE-I or ARB as initial antihypertensive therapy in black patients. • Contraindicated in pregnancy.
eprosartan (Teveten) (Tabs: 400, 600 mg)	**Initial**: 600 mg once daily **Maximum**: 800 mg daily as a single dose or two divided doses	$437	Limited Coverage, Regular Coverage RDP		
irbesartan (Avapro, G) (Tabs: 75, 150, 300 mg)	**Initial**: 150 mg once daily **Usual**: 150 to 300 mg once daily **Maximum** daily dose: 300 mg	$119	Limited Coverage, Regular Coverage RDP		
losartan (Cozaar, G) (Tabs: 25, 50, 100 mg)	**Initial**: 50 mg once daily **Usual**: 25 to 100 mg daily as single dose or two divided doses **Maximum**: 100 mg daily	$124	Limited Coverage, Regular Coverage RDP, Reference Drug		
olmesartan (Olmetec) (Tabs: 20, 40 mg)	**Initial**: 20 mg once daily **Usual**: 20 to 40 mg once daily **Maximum**: 40 mg daily	$403	Limited Coverage, Regular Coverage RDP		
telmisartan (Micardis, G) (Tabs: 40, 80 mg)	**Initial**: 40 mg once daily **Usual**: 40 to 80 mg once daily **Maximum**: 80 mg daily	$111	Limited Coverage, Regular Coverage RDP, Reference Drug		
valsartan (Diovan, G) (Tabs: 40, 80, 160, 320 mg)	**Initial**: 80 mg once daily **Usual**: 80 to 320 mg once daily **Maximum**: 320 mg daily	$112-117	Limited Coverage, Regular Coverage RDP, Reference Drug		
Beta[1]-Adrenergic Antagonists (Beta-Blockers)					
Non-selective					
nadolol (Corgard, G) (Tabs: 40, 80, 160 mg)	**Initial**: 20 mg once daily **Usual**: 160 mg once daily **Maximum**: 320 mg once daily	$89-949	Regular Coverage	Common • Bradycardia, fatigue, decreased exercise tolerance, headache, erectile dysfunction, vivid dreams Less Common • Hyperglycemia, heart failure, heart block, depression *Propranolol has higher lipophilicity than other beta-blockers and is more likely to cause CNS adverse effects (e.g., insomnia, depression, vivid dreams).*	• Avoid non-selective beta-blockers in reactive airways disease (risk of bronchospasm or bronchoconstriction). • Initiate cautiously and titrate slowly in patients with heart failure as beta-blockers may worsen heart failure. • When discontinuing in chronic users, gradually taper doses over 1 to 2 weeks (abrupt discontinuation may precipitate cardiac events, sinus tachycardia and rebound HTN). • Consider alternative antihypertensive in patients at high risk of heart block (contraindicated in 2nd or 3rd degree heart block without pacemaker). • Avoid in severe PAD. • Avoid beta-blockers as initial antihypertensive therapy in patients > 60 years without other compelling indications.antihypertensive therapy in patients > 60 years without other compelling indications.
propranolol (Inderal, G [regular release], Inderal-LA) (10, 20, 40, 80, 120 mg regular release tablet; 60, 80, 120, 160 mg extended release capsule [Inderal-LA])	**Initial**: 40 mg BID using regular release tablets **Usual**: 60 to 320 mg once daily (extended release) for patients stabilized on maintenance dosage of regular release formulation **Maximum**: 320 mg daily *Some patients may require upward titration of the total daily dose of extended release propranolol when switching from regular release tablets.*	$223-914	Regular Coverage		
timolol (Blocadren, G) (Tabs: 5, 10, 20 mg)	**Initial**: 5 mg BID **Usual**: 20 mg BID **Maximum**: 30 mg BID	$130-597	Regular Coverage		

Generic Name (trade name) (strengths and dosage form)	Usual Adult Dosages for Hypertension[b]	Annual Cost[c]	PharmaCare Coverage	Common Adverse Effects	Therapeutic Considerations
Non-selective with intrinsic sympathomimetic activity (ISA)					
pindolol (Visken, G) (Tabs: 5, 10, 15 mg)	**Initial**: 5 mg BID **Usual**: 15 to 45 mg daily **Maximum**: 45 mg daily *For doses > 30 mg daily, give as 3 divided doses.*	$107-399	Regular Coverage	Common • Bradycardia, fatigue, decreased exercise tolerance, headache, erectile dysfunction, vivid dreams Less Common • Hyperglycemia, heart failure, heart block, depression Adverse effects specific to labetalol • Edema, postural hypotension, dizziness, nasal congestion	• Beta-blockers with ISA have a lesser effect on resting heart rate compared to agents without ISA. • Avoid non-selective beta-blockers in reactive airways disease (risk of bronchospasm or bronchoconstriction). • Initiate cautiously and titrate slowly in patients with heart failure as beta-blockers may worsen heart failure. • When discontinuing in chronic users, gradually taper doses over 1 to 2 weeks (abrupt discontinuation may precipitate cardiac events, sinus tachycardia and rebound hypertension). • Consider alternative antihypertensive in patients at high risk of heart block (contraindicated in 2nd or 3rd degree heart block without pacemaker). • Avoid in severe PAD. • Avoid beta-blockers as initial antihypertensive therapy in patients > 60 years without other compelling indications.
labetalol (Trandate, G) (Tabs: 100, 200 mg)	**Initial**: 50 mg BID **Usual**: 200 mg BID **Maximum**: 600 mg BID	$65-1377	Regular Coverage		
Beta$_1$-selective					
atenolol (Tenormin, G) (Tabs: 25, 50, 100 mg)	**Initial**: 25 mg daily **Usual**: 50 mg daily as single dose or divided BID **Maximum**: 100 mg daily as single dose or divided BID	$27-93	Regular Coverage	Common • Bradycardia, fatigue, decreased exercise tolerance, headache, erectile dysfunction, vivid dreams Less Common • Hyperglycemia, heart failure, heart block, depression *Cardiac selectivity of beta$_1$-selective beta-blockers may result in fewer non-cardiac adverse effects.*	• Low doses of beta[1]-selective beta-blockers may be used in patients with mild to moderate reversible airway disease (ensure access to a bronchodilating beta[2]-agonist is readily available). • Initiate cautiously and titrate slowly in patients with heart failure as beta-blockers may worsen heart failure. • When discontinuing in chronic users, gradually taper doses over 1 to 2 weeks (abrupt discontinuation may precipitate cardiac events, sinus tachycardia and rebound hypertension). • Consider alternative antihypertensive in patients at high risk of heart block (contraindicated in 2nd or 3rd degree heart block without pacemaker). • Avoid in severe PAD. • Avoid beta-blockers as initial antihypertensive therapy in patients > 60 years without other compelling indications.
bisoprolol (Monocor, G) (Tabs: 5, 10 mg)	**Initial**: 5 mg once daily **Usual**: 10 mg once daily **Maximum**: 20 mg once daily	$39-114	Regular Coverage		
metoprolol (Lopressor, Betaloc, G) (50, 100 mg regular release tablet; 100, 200 mg sustained release tablet)	**Initial**: 50 mg daily **Usual**: 100 to 200 mg daily **Maximum**: 400 mg daily *Regular release: dose BID; Sustained release: dose once daily.*	$25-197	Regular Coverage		
Beta$_1$-selective with intrinsic sympathomimetic activity (ISA)					
acebutolol (Rhotral, G) (Tabs: 100, 200, 400 mg)	**Initial**: 100 mg daily **Usual**: 400 mg daily as single dose or divided BID **Maximum**: 800 mg daily as single dose or divided BID	$31-194	Regular Coverage	Common • Bradycardia, fatigue, decreased exercise tolerance, headache, erectile dysfunction, vivid dreams Less Common • Hyperglycemia, heart failure, heart block, depression *Cardiac selectivity of beta$_1$-selective beta-blockers may result in fewer non-cardiac adverse effects.*	• Beta-blockers with ISA have a lesser effect on resting heart rate compared to agents without ISA. • Low doses of beta$_1$-selective beta-blockers may be used in patients with mild to moderate reversible airway disease (ensure access to a bronchodilator beta$_2$-agonist is readily available). • Initiate cautiously and titrate slowly in patients with heart failure as beta-blockers may worsen heart failure. • When discontinuing beta-blockers in chronic users, gradually taper doses over 1 to 2 weeks (abrupt discontinuation may precipitate cardiac events, sinus tachycardia and rebound HTN). • Consider alternative antihypertensive in patients at high risk of heart block (contraindicated in 2nd or 3rd degree heart block without pacemaker). • Avoid in severe PAD. • Avoid beta-blockers as initial antihypertensive therapy in patients > 60 years without other compelling indications.

Generic Name (trade name) (strengths and dosage form)	Usual Adult Dosages for Hypertension[b]	Annual Cost[c]	PharmaCare Coverage	Common Adverse Effects	Therapeutic Considerations
Calcium Channel Blockers (CCB)					
Dihydropyridine (DHP)					
amlodipine (Norvasc, G) (Tabs: 2.5, 5, 10 mg)	**Initial**: 2.5 mg once daily **Usual**: 5 to 10 mg once daily **Maximum**: 10 mg daily	$165-331	Regular Coverage RDP, Reference Drug	Common • Adverse effects related to vasodilation (e.g., pedal edema, flushing, headache, palpitations) Serious • Angina, heart failure, pulmonary edema, tachycardia, bradycardia, skin rashes	• Do not use immediate release DHP-CCBs for acute reduction of BP (strokes have been reported). • Do not use immediate release nifedipine to treat essential HTN. • DHP-CCBs may worsen heart failure symptoms. • Grapefruit juice may increase drug levels and potentiate adverse effects (particularly with felodipine). • When discontinuing, taper doses gradually (abrupt withdrawal may provoke chest pain).
felodipine (Plendil, Renedil, G) (2.5, 5, 10 mg extended release tablet)	**Initial**: 2.5 mg once daily **Usual**: 2.5 to 10 mg once daily **Maximum**: 10 mg daily	$125-265	Partial Coverage RDP		
nifedipine (Adalat XL, G) (20, 30, 60 mg extended release tablet)	**Initial**: 30 mg once daily **Usual**: 30 to 60 mg once daily **Maximum**: 90 mg daily	$331-827	Partial Coverage RDP		
Non-dihydropyridine (non-DHP)					
diltiazem (Cardizem CD, Tiazac XC, G) (120, 180, 240, 300, 360 mg extended-release capsule or tablet)	**Initial**: 120 to 240 mg once daily **Usual**: 240 to 360 mg once daily **Maximum**: 360 mg daily	$84-228	Regular Coverage	Common • Headache, peripheral edema, dizziness, bradycardia, flushing, nausea, constipation Serious • Heart block, worsening of heart failure, hypotension, ECG abnormality, asthenia, arrhythmia	• Contraindicated post-MI in patients with moderate or severe left ventricular dysfunction. • Use cautiously in patients with heart failure, or 2nd or 3rd degree heart block without pacemaker. • Grapefruit juice may increase drug levels and potentiate adverse effects. • When discontinuing, taper doses gradually (abrupt withdrawal may provoke chest pain).
verapamil (Isoptin SR, G) (80, 120 mg immediate release tablet; 120, 180, 240 mg sustained-release tablet)	**Initial**: 80 mg TID immediate release; 180 to 240 mg daily sustained-release **Usual**: 160 mg TID immediate release; 180 to 240 mg BID sustained-release **Maximum**: 480 mg daily	$200-688	Regular Coverage		

Abbreviations: ACE-I = angiotensin-converting enzyme inhibitor; ARB = angiotensin II receptor blockers; BID = twice daily; BP = blood pressure; CCB = calcium channel blocker; CNS = central nervous system, CrCl = creatinine clearance in millimeters per minute, CV = cardiovascular, DHP = dihydropyridine; ECG = electrocardiogram; HTN = hypertension; ISA = intrinsic sympathomimetic activity; MI = myocardial infarction, mg = milligram; NSAID = nonsteroidal anti-inflammatory drugs; PAD = peripheral arterial disease; RDP = reference drug program; SCr = Serum creatinine; TID = three times daily.

Footnotes: [a] Not an exhaustive list; [b] For normal renal and hepatic function. Consult product monograph for detailed dosing instructions and dose adjustments for unique patient populations; [c] Pricing is approximate as per PharmaNet from 2014/05/30 to 2014/06/16 and does not include dispensing fee or additional markups, updates to coverage made June 2016.

Note: Please review product monographs at hc-sc.gc.ca/dhp-mps/prodpharma/databasdon/index-eng.php and regularly review current Health Canada advisories, warnings and recalls at www.hc-sc.gc.ca/ahc-asc/media/advisories-avis/index_e.html.

PharmaCare Coverage Definitions: G: generic(s) are available; **Regular Coverage**: also known as regular benefit; does not require Special Authority. Regular benefits may be fully or partially covered.*; **Limited Coverage**: requires Special Authority for coverage. Limited Coverage benefits approved by Special Authority may be fully or partially covered.*; **RDP**: Reference Drug Program. Drugs included in the RDP are comparable agents of the same therapeutic class. Patients receive full coverage of drugs designated as the Reference Drug(s) of the therapeutic class. Other drugs in the same RDP category are covered up to the price of the Reference Drug; **No coverage**: also known as non-benefit; does not fit the above categories.
* Note: Information on which products PharmaCare covers can be obtained using the B.C. PharmaCare Formulary Search (www.health.gov.bc.ca/pharmacare/benefitslookup/). In all cases, coverage is subject to drug price limits set by PharmaCare and to the patient's PharmaCare plan rules and deductibles. See: www.health.gov.bc.ca/pharmacare/plans/index.html and www.health.gov.bc.ca/pharmacare/policy.html for further information.

References:

1. Gray Jean, editor. e-Therapeutics+ [Internet]. Ottawa (ON): Canadian Pharmacists Association; c2014 [cited 2014 Jun 3].
2. e-CPS [Internet]. Ottawa, ON: Canadian Pharmacists Association; c2014 [cited 2014 Jun 3].
3. Lexi-Comp Online [Internet]. Hudson, OH: Lexi-Comp, Inc.; c2014 [cited 2014 Jun 3].
4. Health Canada Drug Product Database Product Monographs. Ottawa, ON: Health Canada; 2014 [cited 2014 Jun 16].

Summary of Guideline: Hypertension – Diagnosis and Management

Effective Date: March 1, 2015

For full guideline, go to: www.BCGuidelines.ca.

When to take BP measurements

- Patients aged ≥ 45 years, record BP at least once every 5 years.
- Use an automated office BP measuring electronic device when taking an office BP.

When is BP considered elevated

- 140/90 is the desirable BP reading for an adult with no co-morbid conditions, diabetes, chronic kidney disease or other target organ damage.
- Individual's desirable BP is influenced by their age, presence of target organ damage, CVD risk level and/or the presence of other CVD risk factors.
- If at any time diastolic BP is > 130 or BP is > 180/110 with signs or symptoms, seek immediate treatment.

When to assess for hypertension

- If an elevated BP is detected, schedule an office visit.
- If BP is elevated again - assess target organ damage and CVD risk:
  - medical history (rule out exogenous factors), physical examination, urinalysis, blood chemistry, FBG or A1c, lipids, ECG, and CVD risk assessment (e.g., Framingham).

When to consider ambulatory or home BP monitoring

- If white-coat hypertension is suspected or unusual fluctuating office-based BP readings, consider ambulatory or home BP monitoring.
- Ambulatory BP monitoring is considered the gold standard to confirm a hypertension diagnosis.

When to diagnosis hypertension

- A diagnosis can be confirmed, if:
  - ambulatory or home BP monitoring indicates an elevated BP; or
  - elevated BP at a 3rd office visit.

When a consultation with a specialist indicated

- Hypertensive emergency; sudden onset in the elderly; abnormal nocturnal BP differences; signs or symptoms suggesting of secondary causes of hypertension; and if BP is difficult to control after treating with 3 antihypertensive medications.

When to implement lifestyle management

- Recommended for mild hypertension (average BP = 140-159/90–99), low-risk for CVD and have no co-morbidities.
- It includes: smoking cessation, increasing physical activity, obtaining or maintaining a healthy body composition, eating a well-balanced diet, moderate alcohol consumption and monitoring salt intake.

When to instigate antihypertensive pharmaceutical management

- Instigate pharmaceutical management in context of the patient's overall CVD risk (e.g., not solely on their BP) and in conjunction with lifestyle management.
- Pharmacologic management may be considered if: 1) average BP is > 140/90 and with target organ damage or CVD risk > 20%; 2) average BP is > 140/90 with 1+ co-morbidities (refer to table below); 3) average BP is ≥ 160/100; or desirable BP is not reached with lifestyle management.

Which antihypertensive drug to use when treating without a specific indication

- In general, antihypertensive medications are equally effective in lowering BP. When prescribing one, take into account cost of the drug, any side-effects and any potential contraindications.
- Consider monotherapy with a first-line drug: thiazide diuretic, calcium channel blocker, ACE-I, or ARB.
- If desirable BP is not achieved with standard-dose monotherapy, use combination therapy by adding one or more of the first-line drugs.

Which antihypertensive drug to use when treating with a specific indication

Co-morbidity	Pharmacologic Treatment Recommendations		Notes
Cardiovascular Disease			
Coronary heart disease	First-line	**ACE-I** *or* **ARB** *or* **Beta-blockers** (for patients with stable angina)	1) Do not use short-acting nifedipine; 2) Do not use ACE-I + ARB if no systolic HF; 3) Caution when lowering SBP to a goal, if DBP is ≤ 60 mm Hg.
	Second-line	**Long-acting CCB** *or* **DHP-CCB** (for high-risk patients and in combination with a first-line ACE-I)	
Myocardial infarction (recent)	First-line	**Beta-blockers + ACE-I/ARB** (if ACE-I intolerant)	1) Do not use non-DHP-CCB (diltiazem, verapamil) if heart failure is present. 2) Caution when lowering SBP to a goal, if DBPis ≤ 60 mm Hg.
	Second-line	**Long-acting CCB** (if beta-blockers contraindicated or ineffective)	
Left ventricular hypertrophy	First-line	**ACE-I/ARB** (if ACE-I intolerant) *or* **Thiazide/Thiazide-like diuretic** *or* **Long-acting CCB**	Do not use direct arterial vasodilators such as hydralazine and minoxidil.
	Second-line	Combination of first-line drugs.	
Heart failure	First-line	**Beta-blockers + ACE-I/ARB** (if ACE-I intolerant) • Aldosterone antagonist may be added in patients with recent CV hospitalization, acute MI, elevated BNP or NT-proBNP level, or NYHA Class II to IV symptoms.	1) If combining aldosterone antagonist to ACE-I/ARB, monitor for hyperkalemia. 2) If combining ACE-I + ARB, monitor for potential adverse events including hypotension, hyperkalemia and worsening of renal function. 3) If bradycardia is also present, avoid use of beta-blockers.
	Second-line	**ACE-I + ARB** *or* **Hydralazine + Isosorbide dinitrate** (if ACE-I + ARB intolerant or contraindicated) • Thiazide/thiazide-like for BP control or loop diuretics for volume control as additive therapy. DHP-CCB may also be used.	
Cerebrovascular disease After acute stroke	First-line	**ACE-I + Thiazide/Thiazide-like diuretic**	1) During acute stroke and not eligible for thrombolytic therapy do not treat HTN unless extreme BP increase. 2) Combination of ACE-I + ARB is not recommended.
	Second-line	**Long-acting DHP-CCB** *or* combination of additional drugs	
Diabetes			
Diabetes with microalbuminuria, CKD, CVD or CVD risk factors	First-line	**ACE-I/ARB** (if ACE-I intolerant)	Loop diuretic could be considered in hypertensive CKD patients with extracellular fluid volume overload.
	Second-line	**DHP-CCB**	
Diabetes	First-line	**ACE-I** *or* **ARB** *or* **Thiazide/Thiazide-like diuretic** *or* **DHP-CCB**	
	Second-line	Combination of first-line drugs • In combination with ACE-I *or* ARB, a DHP-CCB is preferable to a thiazide/thiazide-like diuretic.	
Chronic Kidney Disease			
Chronic kidney disease without diabetes	First-line	**ACE-I/ARB** (if ACE-I intolerant) • Thiazide/thiazide-like diuretic as additive therapy. Loop diuretics for those with volume overload.	1) If using ACE-I or ARB, monitor renal function and potassium. 2) Combination of ACE-I + ARB is not recommended for patients without proteinuria.
	Second-line	Combination of additional drugs	
Renovascular disease	First-line	**Thiazide diuretic** *or* **ACE-I** *or* **ARB** (if ACE-I intolerant) *or* **Long-acting CCB**	Avoid ACE-I or ARB if bilateral renal artery stenosis or unilateral disease with solitary kidney.
	Second-line	Combination of first-line drugs	

A Guide for Patients: Diagnosis of Hypertension

What is hypertension?

Hypertension is the medical term for high blood pressure, in which the pressure on your arteries is higher than it should be. Blood pressure refers to the force of blood against the blood vessel walls as it circulates through your body. Naturally, a person's blood pressure rises and falls during the day. However, when blood pressure constantly stays higher than normal pressure a person is considered to have hypertension. A normal blood pressure is considered 140/90 mm Hg, but this may vary depending on the individual's factors.

Discuss with your health care professional what measurements are desirable for you.

My desirable blood pressure is:

_____ / _____ mm Hg

What causes hypertension?

For about 90 - 95% of peoples with mildly elevated blood pressure, inactive lifestyle, smoking, excess abdominal weight, a fatty diet, alcohol consumption and stress contribute to the condition. For the other 5 - 10% of people, there may be a serious underlying cause of high blood pressure that requires urgent medical attention.

Risk factors for developing hypertension that you can control include lifestyle choices such as:

- Smoking
- Physical inactivity
- Excess weight (especially around the waist)
- High-fat diet
- Excessive salt intake
- Excessive alcohol consumption

Risk factors for developing hypertension that you cannot change are:

- Family history of hypertension, heart disease or stroke
- Age (45 years or older for men; 55 years or older for women)
- Ethnicity (including South Asian, African descent)

Another cause of hypertension may be the use of prescription drugs (such as steroids, oral contraceptives, decongestants and nonsteroidal anti-inflammatory drugs).

How do I know if I have high blood pressure?

Unfortunately, a person with high blood pressure usually does not see or feel any obvious symptoms of hypertension. To confirm you have hypertension, you need to consult a health care professional. Normally this requires several blood pressure measurements at various times.

How can I measure my blood pressure?

There are several ways your blood pressure can be measured, including:

- By a health care professional at their office
- Using an ambulatory blood pressure monitoring device
- Using a home blood pressure monitoring device
- Using a blood pressure monitoring device in a public place (e.g., pharmacy).

For accurate blood pressure measurements, it is important to follow these ABC's:

- *Achieve a calm state* – sit comfortably for 5 minutes, quiet and relaxed. Do not smoke, drink caffeine or alcohol, or exercise within 30 minutes before taking the measurement.
- *Body posture* – sit in a chair with back supported, both feet on the floor with the legs uncrossed, and the arm bare and supported at heart level.
- *Calibrate & check equipment* – use a properly calibrated and validated instrument. Ensure you use the correct cuff size and position the cuff in the mid-way between the elbow and shoulder. For home blood pressure devices, a list of validated devices is listed on Hypertension Canada's website (www.hypertension.ca) and ensure it has the endorsement logo on their package.

What else do I need to know if I am using a home blood pressure monitoring device?

- Confirm with your health care professional which arm you should use for measurements.
- Twice a day (once in the morning and once in the evening), take two measurements using the same arm. Wait one minute in between measurements. In the morning, measure blood pressure twice before taking medication and eating, and after your bladder and bowels are empty. In the evening, measure blood pressure twice before taking medication and before going to bed.
- Record the date and time of both measurements. A blood pressure log and further information can be found on the Hypertension Canada's website (www.hypertension.ca/en/public)

What else do I need to know if I am using an ambulatory blood pressure monitoring device?

- Ambulatory blood pressure monitoring includes having a small digital blood pressure monitor attached to a belt around your waist and connected to a cuff around your upper arm. It is small enough for you to carry on with your normal daily life, though some individuals may find it uncomfortable for the 24-hour monitoring period.
- It is important to keep the device in the correct position on the arm and dry (e.g., no showers, baths or heavy sweating).
- When the machine is about to take a measurement, try to: sit down with legs uncrossed, keep the cuff at the same level as your heart, and arm still.
- It is recommended that you do not drive or do vigorous exercise during the monitoring period.
- Keep a diary of your activities each time a measurement is taken. Also include what time you went to sleep. An activity diary and further information can be found on the British Hypertension Society's website (www.bhsoc.org/resources/abpm/).

How can I find out more about hypertension?

- **Hypertension Canada**, www.hypertension.ca
- **Heart and Stroke Foundation**, www.heartandstroke.bc.ca
- **HealthLinkBC**, www.healthlinkbc.ca or by telephone (toll free) 8-1-1 or 7-1-1 (for the hearing impaired)
- **British Hypertension Society**, www.bhsoc.org/

BCGuidelines.ca

A Guide for Patients: Management of Hypertension

What are my desirable blood pressure measurements?

A normal blood pressure is considered 140/90 mm Hg, but this may vary depending on the individual's factors. Discuss with your health care professional what measurements are desirable for you.

My desirable blood pressure is:

_____ / _____ mm Hg

What are the complications of hypertension?

Hypertension can lead to a number of potentially life-threatening conditions if it is not controlled or treated. The higher your blood pressure, the greater your risk of developing the following problems:

- Heart disease: Hypertension is a major risk factor for heart attack, and the number one risk factor congestive heart failure.
- Stroke: Hypertension is the leading risk factor for stroke. Very high blood pressure can cause a weakened blood vessel to rupture and bleed into the brain. A blood clot blocking a narrowed artery can also cause a stroke.
- Chronic kidney disease (or CKD): Hypertension is the second leading cause of CKD (diabetes is its leading cause) and kidney failure requiring dialysis or transplant.
- Retinopathy (eye damage): Hypertension can cause small blood vessels in the eye to burst or bleed. This can lead to blurred vision or even blindness.
- Peripheral vascular disease (or PVD): Hypertension is an important risk factor for PVD, which is a narrowing and hardening of arteries that leads to restricted blood flow to the legs, arms, stomach or kidneys.
- Impotence or erectile dysfunction: Hypertension is a common cause of erectile dysfunction in males. Hypertension can lead to changes in the blood vessels that may prevent blood from filling the penis or from remaining there long enough to maintain an erection.

How can I reduce my blood pressure?

Discuss with your health care professional what the best management plan is for you. This plan may include lifestyle changes and/or being prescribed an anti-hypertensive medication.

Lifestyle changes may include:

- Stop smoking
- Exercise regularly
- Maintaining a healthy body weight
- Eating a well-balanced diet (e.g., DASH diet) – which include monitoring sodium/salt intake
- Limiting alcohol consumption
- Relaxation therapies.

Medications work in different ways to help lower blood pressure. You may be prescribed one or more of the following drugs:

- Diuretics – which rids the body of excess salt and water
- Beta blockers – which reduces the heart rate and the heart's output of blood
- Vasodilators, angiotensin-converting enzyme inhibitors (ACE-I), angiotensin II receptor blockers (ARBs) and calcium channel blockers – which relax and open up the narrowed blood vessels.

What should I know about taking medications?

- Take medication only as prescribed and do not stop taking medications on your own.
- Ensure you are aware of any side-effects or what other substances (e.g., cold medicines) that may interfere with your anti-hypertensive medications. Tell your health care professional of any side effects. Side-effects depends on which drugs you are taking, but common side effects include:
    - ✓ Weakness, tiredness or drowsiness – Avoid getting up quickly from a seated or lying position, as this can cause dizziness and lead to falls
    - ✓ Cold hands and feet
    - ✓ Depression or sluggishness
    - ✓ Slow or fast heartbeat
    - ✓ Impotence
    - ✓ Skin rash
    - ✓ Loss of taste or dry mouth
    - ✓ Dry, constant cough, stuffy nose or asthma symptoms
    - ✓ Ankle swelling, leg cramps or aches in the joints
    - ✓ Headache, dizziness or swelling around the eyes
    - ✓ Constipation or diarrhea
    - ✓ Fever or anemia
- Ensure the medications are stored as instructed by your health care professional.
- Medications only work when you take it regularly, so it is important to remember to take them. To help remember to take your medications:
    - ✓ Take them at the same time each day, at a meal or another daily event (e.g., brushing your teeth)
    - ✓ Use a weekly pill box with separate compartments for each day, or time of day
    - ✓ Use a medicine calendar, and note every time you take your dose.

Should I use home blood pressure monitoring for my management?

Tracking your blood pressure using a home blood pressure monitoring can help you see the benefits of treatment and lifestyle changes. It may also remind you to take to stick to your management plan. However, even after your blood pressure is lower, you may still need to take medicine – do not stop taking medications unless directed by a health care professional.

How can I find out more about hypertension?

- **BC Guidelines**: *Lifestyle & Self-Management Supplement*, www.BCGuidelines.ca
- **Hypertension Canada**, www.hypertension.ca
- **Heart and Stroke Foundation**, www.heartandstroke.bc.ca
- **HealthLinkBC**, www.healthlinkbc.ca, or by telephone (toll free) 8-1-1 or 7-1-1 (for the hearing impaired)
- **British Hypertension Society**, www.bhsoc.org/