

Management of Hypertension for People with Diabetes

Clinical Paper

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Introduction

Hypertension is a common problem in people with diabetes. This resource provides a comprehensive and detailed summary for practicing clinicians about the treatment of hypertension in people with diabetes. The paper is intended to:

- Highlight the importance of antihypertensive therapy in people with diabetes whose blood pressure is 130/80 mm Hg or higher,
- Outline the recommended approach to reducing blood pressure, vascular risk and other associated risks by both pharmacologic and lifestyle interventions,
- Highlight key information so health care providers can support patient self-management of hypertension and diabetes.

Background

The prevalence of hypertension is high in Canadians with diabetes

Diabetes is a major health issue in Canada and approximately 6.2% of the adult Canadian population had diagnosed diabetes in 2006-7.¹ Hypertension is a very common problem in people with diabetes.² For example, unpublished data from the 2010 Canadian Health Measures Survey indicates that 74% of patients with diabetes have blood pressure greater than or equal to 130/80 mmHg. Historically, the National Diabetes Surveillance System (NDSS) reported that 63% of Canadians with diabetes have hypertension, a rate that is 3 times higher than for those without diabetes.¹ Also, a recent survey in Ontario showed that around 50% of people with diabetes had hypertension.³ Most of the burden of disease is associated with type 2 diabetes.

Hypertension is a major health risk in patients with diabetes but many patients are poorly controlled

Between 60 to 80% of people with diabetes die of cardiovascular complications, with up to 75% of these cardiovascular complications attributable to hypertension, particularly stroke. (Table 1)^{2, 4} Hypertension is also a major factor causing end stage kidney failure, blindness and non traumatic amputation in people with diabetes.⁵ For example, the *United Kingdom Prospective Diabetes Study* (UKPDS) showed that the risk of a myocardial infarction and death rose by 12% for every 10 mmHg increase in systolic blood pressure while the risk of microvascular disease rose 13% for each 10 mmHg rise in blood pressure.⁶ Thus, lowering blood pressure is likely the single most effective way to prevent death and disability in those with diabetes.⁷

Unfortunately, a recent study in Ontario indicated that only one third of patients with diabetes and hypertension were receiving treatment and had controlled hypertension, and that over one quarter with diabetes and hypertension were not being treated for hypertension at all.³ Unpublished data from the 2010 Canadian Health Measures Survey indicates treatment and control rates of 56% in patients with diabetes and hypertension.

Treating hypertension prevents cardiovascular disease and other microvascular complications in people with diabetes

Randomized controlled trials of blood pressure lowering treatments in people with diabetes have demonstrated major reductions in death, cardiovascular disease, eye and kidney disease.⁸⁻¹⁷

For example, the blood pressure lowering arm of the *Action in Diabetes and Vascular Disease: Preterax and Diamicron-MR Controlled Evaluation* (ADVANCE) trial is one of the largest individual studies to date that illustrates the benefits of blood pressure lowering in patients with diabetes.¹¹ It showed that in comparison to placebo, fixed dose combination therapy with perindopril/indapamide, in addition to usual therapy, reduced the incidence of a major macrovascular or microvascular event by 9%, the risks of cardiovascular death by 18% and total mortality by 14%. The reduction in blood pressure in this trial was 5.6/2.2 mmHg vs. placebo.

Additionally, a meta-analysis of randomized, controlled trials on the effects of different blood pressure lowering regimens in people with diabetes showed that more intense vs. less intense therapy, which lowered blood pressure by 6.0 /4.6 mmHg reduced total mortality by 27% and major cardiovascular events by 25%.¹⁵

Historically, data also comes from the *Hypertension Optimal Treatment* (HOT) trial and the *United Kingdom Prospective Diabetes Study* (UKPDS-38). The diabetes subgroup of the HOT trial demonstrated that reduction in diastolic blood pressure of 4 mmHg resulted in a 66% reduction in death from heart disease and stroke.¹⁶ UKPDS-38 showed, that more intense vs. less intense blood pressure control (i.e., mean blood pressure of 154/87 mmHg vs. 144/82 mmHg) resulted in a 32% relative risk reduction in death related to diabetes, a 24% relative risk reduction in diabetes-related end points, and a 37% reduction in microvascular end points, especially retinopathy. Notably, stroke was significantly reduced by 44%.⁹

Finally, treatment of hypertension in elderly and very elderly people (over 80 years of age) has also been associated with a significant reduction in cardiovascular morbidity and mortality, a reduction in strokes and heart failure, and may also preserve renal function.^(5, 17) For example, a post hoc analysis of the *Systolic Hypertension in Europe* (Syst-Eur) trial of isolated systolic hypertension in older patients (systolic blood pressure > 160 mmHg, diastolic blood pressure < 90 mmHg) focusing on outcomes in patients with diabetes, demonstrated that active treatment reduced total mortality by 55%, cardiovascular mortality by 76% and cardiovascular events by 67% with a reduction in blood pressure for 9.8/3.8 mmHg.⁽⁸⁾

Target blood pressure for people with diabetes is less than 130/80 mmHg

The Canadian Hypertension Education Program (CHEP) and the Canadian Diabetes Association (CDA) recommend that people with diabetes achieve and maintain a blood pressure of less than 130/80 mm Hg.^(5, 18)

These targets are based on the best available evidence, which has included the HOT and UKPDS-38 randomized controlled trials for the diastolic target of < 80 mmHg^(9, 16) and less rigorous evidence, most notably the normotensive *Appropriate Blood Pressure Control in Diabetes* (ABCD) trial for the systolic target of <130 mmHg.^(6, 10, 19)

New Evidence

The blood pressure arm of the *Action to Control Cardiovascular Risk in Diabetes* (ACCORD) study was published in 2010 and directly looked at if a systolic blood pressure target of less than 120 mmHg (intensive therapy) might be preferable to a target of less than 140 mmHg (standard therapy) in patients with diabetes.⁽²⁰⁾ There were no significant benefits of the intensive target on the primary composite outcome of non-fatal MI, nonfatal stroke or CV death, or secondary outcomes of all cause mortality,

or CV death. There was a 41% reduction in total stroke and a 37% decrease in non-fatal stroke. Significant adverse events due to antihypertensive therapy were more common in the intensive therapy arm (3.3 % vs. 1.3 %). These included: hypotension, syncope, bradycardia, hyperkalemia, angioedema, and renal failure.

Although these results do not support the blood pressure goal of <130/80 mmHg, for now, CHEP recommends no change to the current blood pressure target of < 130/80 mmHg. Data from the *Avoiding Cardiovascular Events through Combination Therapy in Patients Living with Systolic Hypertension* (ACCOMPLISH) trial is relevant although it did not specifically address the target blood pressure like ACCORD. The ACCOMPLISH study, contained a large subgroup with diabetes and there was no deleterious effect of the blood pressures seen; 132/73 mmHg in the benazepril-amlodipine group and 133/74 mmHg in the benazepril-hydrochlorothiazide group.⁽²¹⁾

Combination therapy is usually required to achieve a blood pressure < 130/80 mmHg
Many people with hypertension and diabetes will require the use of 3 or 4 medications to achieve target blood pressure levels. For example, in the UKPDS-38 study, 29% of those in the tight blood pressure group required 3 or more medications.⁽⁹⁾ In the *Antihypertensive and Lipid Lowering Treatment to Prevent Heart Attack* (ALLHAT) study, up to 1/3 of subjects required more than 3 medications.⁽²²⁾

Although treatment with multiple drug regimens is more expensive, treating hypertension in people with diabetes is a cost-effective medical intervention that reduces death and disability. Preventing the complications of diabetes such as cardiovascular disease as well as diseases of the eyes and kidneys by lowering blood pressure is cost effective.⁽⁴⁾

Hypertension management in people with diabetes

Hypertension is a treatable risk factor for adverse outcomes in patients with diabetes. Treatment includes lifestyle interventions and pharmacotherapy to lower blood pressure, reduction of overall vascular risk, and promotion of self-management education. For people with diabetes whose blood pressure is 130/80 mmHg or higher, CHEP and CDA recommend that pharmacotherapy and lifestyle modifications should be initiated concurrently.⁽¹⁸⁾

Pharmacotherapy Recommendations

The approach to pharmacological treatment of hypertension in people with diabetes is summarized in Figure 1.⁽²³⁾

Initial Therapy

- For persons with cardiovascular or kidney disease, including microalbuminuria or with cardiovascular risk factors in addition to diabetes and hypertension, an angiotensin converting enzyme (ACE) inhibitor or an angiotensin receptor blocker (ARB) is recommended as initial therapy.
- For persons with diabetes and hypertension not included in the above recommendation, appropriate choices include (in alphabetical order): ACE inhibitors, ARBs, dihydropyridine calcium channel blockers (CCBs), and thiazide/thiazide-like diuretics.
- If blood pressure is 150/90 mmHg or greater, combination therapy using 2 first

line agents may be considered as initial treatment of hypertension. Caution should be exercised in patients in whom a substantial fall in blood pressure is more likely or poorly tolerated.

Additional Therapy

- If target blood pressures are not achieved, additional therapies should be used.
- For persons in whom combination therapy with an ACE inhibitor is being considered, CHEP recommends that addition of a dihydropyridine CCB is preferable to hydrochlorothiazide.⁽²¹⁾
- Alpha-blockers are not recommended as monotherapy or add on therapy for the treatment of hypertension in persons with diabetes, based on the ALLHAT trial.
- Potent 4 drug regimens are illustrated in Table 2.
- Combinations of ACE inhibitors and ARBs, have more adverse effects than ACE inhibitor therapy on its own and offers no therapeutic advantage, therefore combinations of an ACE inhibitor with an ARB are specifically not recommended in the presence of normal urinary albumin levels.
- CHEP still discourages the use of two drug antihypertensive combinations with an ACE inhibitor/ ARB and beta-blocker unless there is a compelling indication such as heart failure, angina or postmyocardial infarction.
- If blood pressure control is not achieved with sequential addition of antihypertensive drugs, consider making a referral to a physician or healthcare provider who is an expert in hypertension.

Therapeutic Tips: Antihypertensive Pharmacotherapy

Diuretic Therapy

- Initial therapy: ACE inhibitors, ARBs, dihydropyridine CCBs or thiazide/thiazide-like diuretics,
- Although many clinicians are uncomfortable prescribing diuretics to people with diabetes, possibly because diuretics cause a small increase in blood glucose, diuretics have been shown to be equally effective as ACE inhibitors in preventing cardiovascular complications.
- Maintaining a normal serum potassium level is important to minimize the effect of diuretics on blood glucose and maximize cardiovascular event reductions.
- Substitute a loop diuretic if creatinine clearance is less than 30 mL/min if volume control is required.
- Patients with diabetes have a higher incidence of chronic kidney disease and increased monitoring of potassium is warranted.

Vascular Risk Reduction

Although hypertension is a leading risk in people with diabetes, a comprehensive approach to vascular risk reduction is required. Addressing dyslipidemia, smoking, hyperglycemia, and use of antiplatelet agents may reduce vascular risk. Notably, the Steno-2 study has shown that a comprehensive program including lifestyle modification and pharmacotherapy, in comparison to conventional treatment, reduces total mortality by 40% in patients with type 2 diabetes.^(25, 26)

Those with diabetes at high risk for cardiovascular events include:⁽²⁷⁾

- Men age 45 or older, Women age 50 or older,
- Men younger than age 45 & women younger than 50 who have 1 or more of:

- Macrovascular disease including silent myocardial infarction or ischemia, or evidence of peripheral arterial disease, carotid arterial disease and cerebrovascular disease
- Microvascular disease especially nephropathy and retinopathy
- Family history of premature coronary or cerebrovascular disease in a first-degree relative,
- Extreme single risk factor such as low-density lipoprotein (LDL) greater than 5.0mmol/L or systolic blood pressure greater than 180 mmHg
- Have had diabetes longer than 15 years and is older than 30 years of age

Dyslipidemia

The benefits of lowering low-density lipoprotein (LDL) with statin therapy are well established for people with diabetes. Dyslipidemia and diabetes are common comorbidities and together, increase the risk of vascular disease. For many patients, medication therapy will be required in addition to ongoing changes in lifestyle. A meta analysis including 18,000 people with diabetes demonstrated that every 1 mmol/L reduction in LDL was associated with a 9% reduction in total mortality, a 13% reduction in cardiovascular mortality, and a 21% reduction in major cardiovascular events.⁽²⁸⁾ The CDA recommends that a primary target for most people with diabetes is an LDL equal to or less than 2.0 mmol/L.⁽²⁹⁾

Smoking Cessation

Living and working in a tobacco free environment is recommended by CHEP and the CDA. It has been shown that the excess risk of coronary heart disease caused by smoking is reduced by about one half, after 1 year of quitting smoking and then declines gradually.⁽²⁹⁾ It is never too late to stop smoking.

Management of Hyperglycemia

Improved glycemic control improves microvascular complications in type 2 diabetes but has not been found to reduce major cardiovascular events.^(30, 31) The CDA recommended targets for glycemic control for most individuals with type 1 or type 2 diabetes are⁽³²⁾

- Glycated hemoglobin (A1C) of less than or equal to 7.0%.
- Fasting plasma glucose or preprandial plasma glucose: 4.0-7.0 mmol/L
- 2-hour postprandial plasma glucose: 5.0-10.0mmol/L (5.0-8.0mmol/L if A1C targets not being met)

Antiplatelet Therapy

The current evidence for the use of ASA in patients with hypertension and diabetes is unclear. The CDA currently recommends consideration of low dose ASA therapy in people with stable cardiovascular disease. The decision to prescribe antiplatelet therapy for primary prevention of cardiovascular events should be based on individual clinical judgment.²⁷ Although patients without diabetes in the HOT trial benefited from ASA therapy, other studies have shown no benefit from ASA in the primary prevention of cardiovascular events in patients with diabetes.^(16, 33, 36)

Lifestyle Interventions

Several lifestyle interventions are effective in preventing and treating hypertension. These interventions can also reduce the risk of developing type 2 diabetes, reduce blood glucose, improve other markers of vascular risk and improve overall quality of life. They include healthy eating, maintaining a healthy body weight, physical activity, smoking cessation, limiting alcohol consumption and stress management. (Table 3)

Lifestyle modifications can reduce blood pressure by 2 to 11 mmHg. Note however, that the magnitude of blood pressure lowering benefits described are not derived specifically from people with hypertension and diabetes. In the context of hypertension, the benefits of each individual lifestyle intervention is typically equivalent to one antihypertensive medication.⁽¹⁸⁾ Several studies in patients with diabetes have established benefits of lifestyle modification on markers of vascular risk.^(37, 38)

Healthy eating

The CDA recommends nutrition counseling by a registered dietitian.³⁹ Nutrition therapy has been associated with lower A1C levels and can contribute to the prevention and treatment of long-term complications, diabetes comorbidities and accompanying disorders. Nutrition therapy should be individualized and has been shown to be equally effective in a small group or one-to-one setting.⁽³⁸⁾

A healthy diet is considered the cornerstone of hypertension and diabetes management. Most people with diabetes are advised to follow a meal plan that is close to *Eating Well with Canada's Food Guide*. Additionally, the *Dietary Approach to Stop Hypertension* (DASH) diet has been shown to reduce blood pressure by 11.4/5.5 mmHg in people with hypertension.⁽³⁹⁾ The DASH recommends a diet rich in fruits and vegetables, whole grains, low fat dairy products, dietary fibre, and low in saturated fats, cholesterol and salt. The DASH diet principles fit well into meal planning for people with diabetes. For information on the DASH diet go to:

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

Limiting sodium intake

According to CHEP Recommendations, to decrease blood pressure, consider reducing sodium intake towards 2,000 mg (5g of salt or 87mmol of sodium) per day. It is estimated the average Canadian currently consumes about 3,000 mg/day of sodium.⁴¹ Reducing sodium in patients with hypertension by 1,800 mg per day has been demonstrated to reduce blood pressure by 5.1/2.7 mmHg.⁽⁴¹⁾

Reducing salt at the table has some effect but most sodium intake comes from processed foods and eating out. Therefore, development and implementation of a population health strategy to reduce sodium intake among Canadians is a major focus.⁽⁴²⁾

Consider these factors when discussing ways to reduce sodium intake:

- Eat fewer processed canned and instant foods
- Choose fresh foods more often
- Limit salted snack foods, such as nuts, chips or popcorn
- Do not add salt to home cooking, use spices instead
- Take the salt shaker off the table

- Read labels and select lower salt options of similar foods

For information on reducing sodium intake go to www.hypertension.ca

Body weight & abdominal obesity

Attaining and maintaining a healthy body weight is recommended to improve hypertension as well as other vascular risk factors. The *Trials of Hypertension Prevention* (TOHP) study found that a decrease of 4.4 kg led to a blood pressure reduction of 4.0/2.8 mmHg. ⁽⁴³⁾

CHEP suggests that body mass index (BMI) should be between 18.5 & 24.9kg/m² to reduce health risks. ⁽¹⁸⁾ CHEP also suggests waist targets for reducing health risks as shown in Table 3. A weight loss of 5 to 10% of the initial body weight can improve insulin sensitivity, as well as blood glucose, blood pressure and blood lipid levels. The optimal rate of weight loss is 1 to 2 kg per month. ⁽⁴⁴⁾ Achieving and maintaining a healthy body weight requires effective lifestyle interventions.

Physical activity

For people with hypertension, CHEP recommends regular 30-60 minutes of moderate intensity, dynamic exercise 4-7 days per week in addition to regular daily activities. This recommendation is similar to the CDA's recommendations, which include:

- 150 minutes of moderate to vigorous-intensity aerobic exercise (including brisk walking, jogging, swimming or cycling) each week, spread over at least 3 days of the week, with no more than 2 consecutive days without exercise plus
- Resistance exercise 3 times per week.

Regular physical activity has been shown to lower blood pressure by 3.8/2.6 mmHg in people who were previously inactive. ⁽⁴⁵⁾ Further information regarding the new Canadian Physical Activity guidelines may be found at www.csep.ca

An exercise ECG stress test should be considered for previously sedentary individuals who are at high risk for cardiovascular disease and who wish to undertake exercise more vigorous than brisk walking. ⁽³⁷⁾ Starting an activity program is difficult for many people; they should be encouraged to start slowly and gradually build up in intensity and duration. Walking should be encouraged. It is the least expensive and easiest activity for most people.

Low risk alcohol consumption

Excess alcohol intake is associated with the development of hypertension. Alcohol reduction for people with hypertension is associated with blood pressure reductions of approximately 3/2 mmHg. ⁽⁴⁶⁾ Alcohol consumption should be limited to no more than 2 standard drinks per day and less than 14 standard drinks per week for men and less than 9 for women. ⁽¹⁸⁾

Stress management

For all aspects of managing diabetes, patients should be encouraged and supported in making decisions, setting their own goals and providing feedback about all aspects of their diabetes. For those who develop diabetes, the demands of adjusting to and managing this condition are significant. Health care providers should be alert to and screen regularly for depression and psychological distress.⁽⁴⁷⁾

CHEP recommends that for hypertensive patients in whom stress may be contributing to blood pressure elevation, stress management should be considered as an intervention.⁽¹⁸⁾

Self-Management Education

Self-management education is one strategy to increase adherence to lifestyle interventions and medications. This form of education aims to increase the individual's involvement in, confidence with, and motivation for control of their hypertension, its treatment and its effect on their lives.⁽⁴⁸⁾ Ways to promote self-management education include: self-monitoring blood pressure, interdisciplinary team care and behavioral interventions.

Self-monitoring blood pressure

People with hypertension and diabetes should be encouraged to self-monitor all aspects of their management plan including blood pressure to facilitate self-management and self-efficacy. They should know their blood pressure goal. In order to facilitate prompt adjustments to treatment and help attain the individual's goal, people should be encouraged to inform their physician when their blood pressure changes or is not within the target levels.

Self-monitoring can be done with a Hypertension Canada approved home monitoring device. When self-monitoring, people should aim for a target blood pressure that is somewhat lower than the blood pressure reading taken in the doctor's office. While targets have not been set for self monitoring of blood pressure other than below 130/80 mmHg, the 'white coat' effect may contribute to a somewhat higher reading in the doctor's office.

Recommend the following for home blood pressure monitoring:

- Check the blood pressure twice a day, every day for one week prior to a visit to the healthcare professional,
- Record blood pressure levels in a logbook. Health care providers should provide the log book and show the person how to record their numbers,
- Patients should bring the logbook to all appointments with the healthcare professional.

For more information

- www.hypertension.ca - instructions for purchasing and using a home blood pressure monitor
- www.hypertension.ca - instructional video on home blood pressure measurement
- www.heartandstroke.ca/BP - risk assessment
- www.hypertension.ca - sodium and hypertension

Interventions to Improve Adherence to Lifestyle Changes and Medications

Here are a few examples of successful interventions that have supported ongoing lifestyle changes in patients with hypertension:

- Team-based health care is advocated for the management of chronic diseases and has been advocated as routine clinical care of hypertension in Canada. ⁽⁴⁹⁾ CHEP recommends that health care teams incorporate a pharmacist to improve monitoring of adherence with pharmacologic and lifestyle modification.
- Based on the belief that not adhering to medication regimens likely contributes to inadequate blood pressure control for two-thirds of all hypertensive patients, a tailored behavioral telephone intervention (average time required ~18 minutes) in patients with hypertension (34% also had diabetes) by nurses over a two year period reported a significant improvement in self-reported adherence to antihypertensive medications. ⁽⁵⁰⁾
- When patients with diabetes used goal-setting, two randomized trials showed significant reduction in important disease markers such as systolic hypertension. This requires a collaborative relationship between people with the chronic condition and care providers. ⁽⁵¹⁾
- Ongoing education and encouragement in the process of achieving behavior modification was an important part of the Steno-2 study. This study showed sustained benefits in vascular complications, death rates from any cause and from cardiovascular causes. ^(25, 26)
- Patient participation in medical decision-making is paramount: Patients who express their concerns, ask questions, detail their symptoms and state expectations receive more information and support from physicians, they also experience greater improvement in health, have a better understanding of treatment options and are more committed to treatment plans. ⁽⁵²⁾
- The CDA recognizes empowerment as an essential psychological component in self-management education. Empowerment occurs when people make informed self-management decisions with an awareness of the impact that these decisions have on their lives. ⁽⁵³⁾

Special Populations

The CHEP guidelines regarding treatment of hypertension in people with diabetes do not differ for special populations as defined by age or ethno-cultural background. Despite this, a few points are worthy of consideration.

Elderly

Treatment of hypertension in people over 80 years of age has been associated with a significant reduction in cardiovascular morbidity and mortality and reduction in strokes and heart failure, and may also preserve renal function. ⁽¹⁷⁾ Caution should be exercised in treating hypertension in frail elderly patients and those with autonomic neuropathy where the risks of therapy and hypotension are likely to be higher. ⁽¹⁸⁾ People in whom the risk may outweigh the benefit could include those with postural hypotension, post-prandial hypotension and people who have a poor short term prognosis due to competing comorbidity.

Canadian Aboriginal Peoples (First Nations, Inuit & Métis) & South Asian Peoples

Type 2 diabetes has reached epidemic proportions among Aboriginal peoples in Canada, where national age adjusted prevalence is 3 to 5 times higher than that of the general population.⁵⁶ Individuals from high-risk ethnic populations also develop diabetes complications, particularly cardiovascular disease and renal failure, much earlier than other populations. Given the high cardiovascular mortality in South Asians, aggressive management of risk factors, including hypertension and dyslipidemia, is warranted to reduce morbidity and mortality.⁽⁵⁵⁾

Ethnocultural minority groups frequently have poorly controlled hypertension and diabetes. Aboriginal or etho-cultural specific disease management programs may play a role in better management.^(54, 55)

Healthcare providers ... a call to action

There has never been a more pressing time for health care providers to coordinate their efforts in helping people manage their hypertension and diabetes. The recognition that among people with diabetes, hypertension either goes undetected and undertreated for the majority, underscores the importance of sharing expertise and promoting public education in pursuit of effective management strategies. Hypertension is the most common of chronic diseases and most people with diabetes have or will develop hypertension. More than two million Canadians have diabetes and this number is rising. People with these chronic conditions all benefit from the implementation of effective self-management education strategies.

This project represents the recommendations from the 2010 Canadian Hypertension Education Program and the Canadian Diabetes Association 2008 Clinical Practice Guidelines, as they relate to the treatment of people with hypertension and diabetes while acknowledging the importance of self-management.

Hypertension and Diabetes: Key Messages

Up to 80% of people with diabetes and hypertension will die of cardiovascular disease, especially stroke.

1. Ensure people with diabetes are screened for hypertension.

Diagnosis of hypertension in diabetes: Blood pressure \geq 130/80 mm Hg, confirmed within one month.

2. Assess blood pressure at all appropriate healthcare visits.

Regular monitoring of blood pressure forms the basis for making decisions about treatment and reinforces the importance of maintaining a target blood pressure level.

3. Encourage home monitoring with approved devices.

- Home blood pressure readings are more strongly associated with improved cardiovascular outcomes than readings taken in a healthcare professional's office.
- Home readings can be used to:
 - confirm the diagnosis of hypertension
 - improve blood pressure control
 - reduce the need for medications in those with 'white coat' effect,
 - identify those with 'white coat' and masked hypertension and
 - improve medication adherence.
- Target home reading:
 - <130/80 mmHg

4. Pharmacotherapy and lifestyle should be initiated concurrently.

- Aggressive treatment using multiple (3 or more) blood pressure lowering medications is often required to achieve target levels of less than 130/80 mm Hg for people with diabetes.
- First line therapies include in alphabetic order ACE inhibitors, angiotensin receptor blockers, dihydropyridine calcium-channel blockers and thiazide or thiazide-like diuretics.

5. Assess and manage all other vascular risk factors.

A comprehensive approach is needed to address the following risk factors: smoking, dyslipidemia, glycemic control, obesity, unhealthy eating and physical inactivity. A reduction in these risk factors can more than half their vascular risk.

6. Enable sustained lifestyle modification and medication adherence.

- At every visit, people should be asked how they are managing their blood pressure.
- Recommended lifestyle changes, especially limiting sodium intake, and medication adherence should be reviewed at each visit.

Stay Informed!

For professionals

- Online course 15.5 “The Interdisciplinary Management of Hypertensive Patients”
- Sign up for free monthly news updates, featured research and educational resources
- Become a member for special privileges and savings

Healthcare professionals can also download current resources at www.hypertension.ca

A case-based interactive lecture series on clinically important hypertension topics will also be launched on the internet so healthcare professionals can learn and interact with top national hypertension experts. The lecture series will feature important clinical topics provided by national experts, have a case presentation and an opportunity to ask questions and make comments.

CHEP will also continue and expand a program to train community leaders in hypertension.

We invite you to visit the **Canadian Diabetes Association** website at www.diabetes.ca. You can find material to assist healthcare professionals and those with diabetes in diabetes management.

Additional Resources

www.hypertension.ca - CHEP guidelines

www.hypertension.ca - instructional video on home blood pressure measurement

www.diabetes.ca - CDA guidelines and other resources

www.dietitians.ca - Healthy Eating

www.dialadietitian.org

www.nhlbi.nih.gov/health/public/heart/hbp/dash/new_dash.pdf - DASH Diet

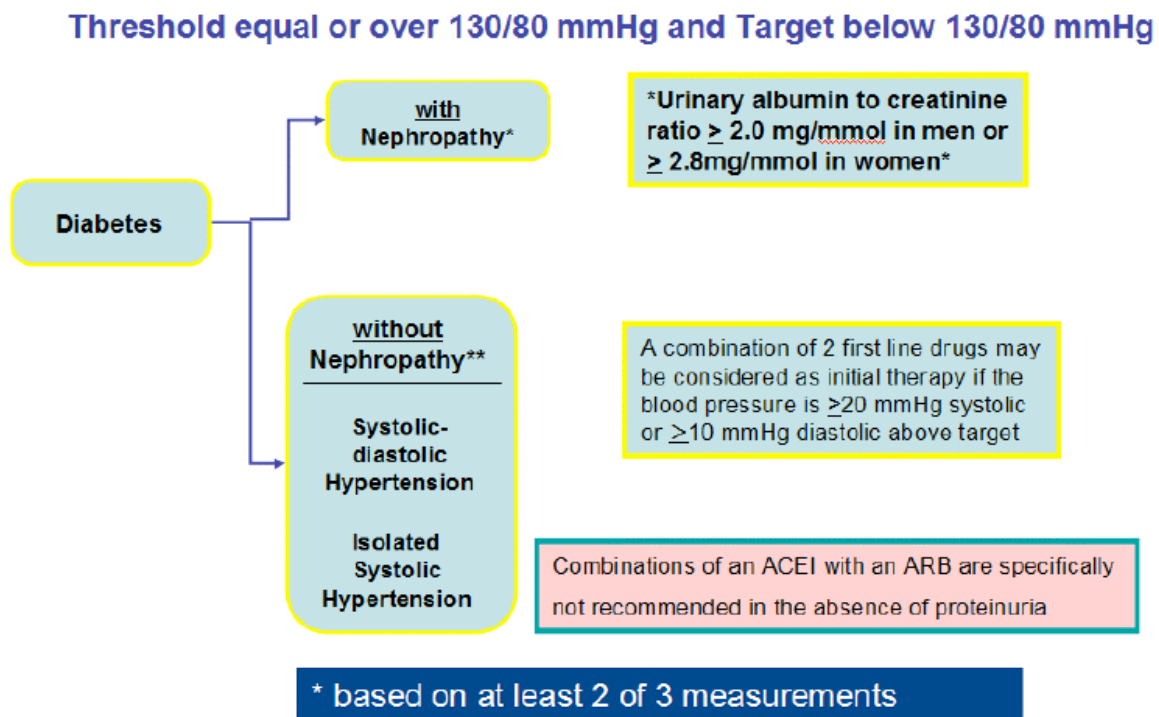
www.csep.ca - Canadian Physical Activity Guidelines

www.phac-aspc.gc.ca/index-eng.php - Public Health Agency of Canada

www.heartandstroke.ca - Online Blood Pressure Action Plan

www.heartandstroke.ca/mobileapps - Heart and Stroke Foundation's *My Blood Pressure Action Plan App* for Apple, Android or Blackberry platforms

Figure 1. Treatment Algorithm for Hypertension in People with Diabetes



Legend

nephropathy is defined as albumin to creatinine ratio ≥ 2.0 for men or ≥ 2.8 for women

Table 1 Proportion of Complications of Diabetes Attributable to High Blood Pressure*

Complication	Proportion attributable to hypertension
Stroke	75%
Coronary Artery Disease	35%
End stage renal disease	50%
Eye disease**	35%
Leg amputation	35%

*Hypertension defined as $\geq 160/95$ mmHg and $\geq 140/90$ mmHg in different studies.

** Defined as retinopathy.

Data from reference ⁽⁵⁶⁾

Table 2 Potential Antihypertensive Combinations for Management of Hypertension in Patients with Diabetes

2 Drug Combinations	4 Drug Combinations
<ul style="list-style-type: none"> • ACE inhibitor plus dihydropyridine CCB 	<ul style="list-style-type: none"> • ACE inhibitor, long acting dihydropyridine CCB, thiazide/thiazide-like, and long acting cardioselective beta blocker
<ul style="list-style-type: none"> • ACE inhibitor plus thiazide/thiazide-like diuretic 	<ul style="list-style-type: none"> • ARB, long acting dihydropyridine CCB thiazide/thiazide-like, and long acting cardioselective beta blocker
<ul style="list-style-type: none"> • ARB plus dihydropyridine CCB 	
<ul style="list-style-type: none"> • ARB plus thiazide/thiazide-like diuretic 	

Table 3. Summary of Lifestyle Recommendations

Intervention	Target	
Sodium reduction	2g /day	
Healthy diet	DASH diet, Eating Well with Canada's Food Guide	
Physical activity	30-60 minutes 4-7 days/week in addition to daily activities*	
Low risk alcohol consumption	≤ 2 drinks/day AND $<$ than 14/week for men and < 9 /week for women	
Tobacco free environment		
Attaining and maintaining ideal body weight	BMI 18.5-24.9 kg/m ²	
Waist circumference	Men	Women
Europid, Sub-Saharan African, Middle Eastern	< 102 cm	< 88 cm
South Asian, Chinese	< 90 cm	< 80 cm

Note the CDA encourages resistance exercise 3x/week in addition to aerobic exercise

Table 4: Targets for Dietary Sodium

Age	Adequate Intake (mg/day)	Upper limit (mg/day)
14-50	1500	2300
51-70	1300	2300
> 70	1200	2300

According to CHEP Recommendations, to decrease blood pressure, consider reducing sodium intake towards 2,000 mg (5g of salt or 87mmol of sodium) per day.

References

1. National Diabetes Surveillance System. Report from the National Diabetes Surveillance System: Diabetes in Canada, 2009 Available at <http://www.ndss.gc.ca>. Accessed February 9th, 2011.
2. Sowers JR, Epstein M, Frohlich ED. Diabetes, hypertension, and cardiovascular disease: an update. *Hypertension* 2001;37:1053-1059
3. Leenen FH, Dumais J, McInnis NH, et al. Results of the Ontario survey on the prevalence and control of hypertension. *CMAJ* 2008;178:1441-1449
4. Campbell NR, Leiter LA, Larochelle P, et al. Hypertension in diabetes: a call to action. *Can J Cardiol* 2009;25:299-302
5. Canadian Diabetes Association Clinical Practice Guideline Expert Committee. Treatment of Hypertension. In: Canadian Diabetes Association Clinical Practice Guideline Expert Committee, ed. Canadian Diabetes Association 2008 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada; 2008:S115-S118. Available from www.diabetes.ca
6. Adler AI, Stratton IM, Neil HA, et al. Association of systolic blood pressure with macrovascular and microvascular complications of type 2 diabetes (UKPDS 36): prospective observational study. *Bmj* 2000;321:412-419
7. Cost-effectiveness of intensive glycemic control, intensified hypertension control, and serum cholesterol level reduction for type 2 diabetes. *JAMA* 2002;287:2542-2551
8. Tuomilehto J, Rastenyte D, Birkenhager WH, et al. Effects of calcium-channel blockade in older patients with diabetes and systolic hypertension. Systolic Hypertension in Europe Trial Investigators. *N Engl J Med* 1999;340:677- 684
9. UK Prospective Diabetes Study Group. Tight blood pressure control and risk of macrovascular and microvascular complications in type 2 diabetes: UKPDS 38. *BMJ* 1998;317:703-713
10. Schrier RW, Estacio RO, Esler A, et al. Effects of aggressive blood pressure control in normotensive type 2 diabetic patients on albuminuria, retinopathy and strokes. *Kidney Int* 2002;61:1086-1097
11. Patel A, MacMahon S, Chalmers J, et al. Effects of a fixed combination of perindopril and indapamide on macrovascular and microvascular outcomes in patients with type 2 diabetes mellitus (the ADVANCE trial): a randomised controlled trial. *Lancet* 2007;370:829-840
12. Effects of ramipril on cardiovascular and microvascular outcomes in people with diabetes mellitus: results of the HOPE study and MICRO-HOPE substudy. Heart Outcomes Prevention Evaluation Study Investigators. *Lancet* 2000;355:253-259
13. Brenner BM, Cooper ME, de Zeeuw D, et al. Effects of losartan on renal and cardiovascular outcomes in patients with type 2 diabetes and nephropathy. *N Engl J Med* 2001;345:861-869

14. Lewis EJ, Hunsicker LG, Clarke WR, et al. Renoprotective effect of the angiotensin-receptor antagonist irbesartan in patients with nephropathy due to type 2 diabetes. *N Engl J Med* 2001;345:851-860
15. Turnbull F, Neal B, Algert C, et al. Effects of different blood pressure-lowering regimens on major cardiovascular events in individuals with and without diabetes mellitus: results of prospectively designed overviews of randomized trials. *Arch Intern Med* 2005;165:1410-1419
16. Hansson L, Zanchetti A, Carruthers SG, et al. Effects of intensive blood-pressure lowering and low-dose aspirin in patients with hypertension: principal results of the Hypertension Optimal Treatment (HOT) randomised trial. HOT Study Group. *Lancet* 1998;351:1755-1762
17. Abaterusso C, Lupo A, Ortalda V, et al. Treating elderly people with diabetes and stages 3 and 4 chronic kidney disease. *Clin J Am Soc Nephrol* 2008;3:1185-1194
18. Hackam DG, Khan NA, Hemmelgarn BR, et al. The 2010 Canadian Hypertension Education Program recommendations for the management of hypertension: part 2 - therapy. *Can J Cardiol* 2010;26:249-258
19. Orchard TJ, Forrest KY, Kuller LH, et al. Lipid and blood pressure treatment goals for type 1 diabetes: 10-year incidence data from the Pittsburgh Epidemiology of Diabetes Complications Study. *Diabetes Care* 2001;24:1053-1059
20. Cushman WC, Evans GW, Byington RP, et al. Effects of intensive blood-pressure control in type 2 diabetes mellitus. *N Engl J Med* 2010;362:1575-1585
21. Jamerson K, Weber MA, Bakris GL, et al. Benazepril plus amlodipine or hydrochlorothiazide for hypertension in high-risk patients. *N Engl J Med* 2008;359:2417-2428
22. Whelton PK, Barzilay J, Cushman WC, et al. Clinical outcomes in antihypertensive treatment of type 2 diabetes, impaired fasting glucose concentration, and normoglycemia: Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial (ALLHAT). *Arch Intern Med* 2005;165:1401-1409
23. Hackam DG, Khan NA, Hemmelgarn BR, et al. The 2010 Canadian Hypertension Education Program recommendations for the management of hypertension: part 2 - therapy. *Can J Cardiol*;26:249-258
24. Parving HH, Brenner BM, McMurray JJ, et al. Aliskiren Trial in Type 2 Diabetes Using Cardio-Renal Endpoints (ALTITUDE): rationale and study design. *Nephrol Dial Transplant* 2009;24:1663-1671
25. Gaede P, Vedel P, Larsen N, et al. Multifactorial intervention and cardiovascular disease in patients with type 2 diabetes. *N Engl J Med* 2003;348:383-393
26. Gaede P, Lund-Andersen H, Parving HH, et al. Effect of a multifactorial intervention on mortality in type 2 diabetes. *N Engl J Med* 2008;358:580-591
27. Canadian Diabetes Association Clinical Practice Guideline Expert Committee. Vascular Protection in People with Diabetes. In: Canadian Diabetes Association Clinical Practice Guideline Expert Committee, ed. Canadian Diabetes Association 2008 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada; 2008:S102- S106. Available from www.diabetes.ca

28. Kearney PM, Blackwell L, Collins R, et al. Efficacy of cholesterol-lowering therapy in 18,686 people with diabetes in 14 randomised trials of statins: a meta-analysis. *Lancet* 2008;371:117-125
29. U.S. Department of Health and Human Services. The Health Benefits of Smoking Cessation. Surgeon General's Report on Smoking and Health. Atlanta: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 1990. DHHS Publication No. (CDC) 90-8416.
30. Nathan DM, Cleary PA, Backlund JY, et al. Intensive diabetes treatment and cardiovascular disease in patients with type 1 diabetes. *N Engl J Med* 2005;353:2643-2653
31. Patel A, MacMahon S, Chalmers J, et al. Intensive blood glucose control and vascular outcomes in patients with type 2 diabetes. *N Engl J Med* 2008;358:2560-2572
32. Canadian Diabetes Association Clinical Practice Guideline Expert Committee. Targets for Glycemic Control. In: Canadian Diabetes Association Clinical Practice Guideline Expert Committee, ed. Canadian Diabetes Association 2008 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada; 2008:S29-S31. Available from www.diabetes.ca
33. Collaborative meta-analysis of randomised trials of antiplatelet therapy for prevention of death, myocardial infarction, and stroke in high risk patients. *BMJ* 2002;324:71-86
34. Ogawa H, Nakayama M, Morimoto T, et al. Low-dose aspirin for primary prevention of atherosclerotic events in patients with type 2 diabetes: a randomized controlled trial. *JAMA* 2008;300:2134-2141
35. Belch J, MacCuish A, Campbell I, et al. The prevention of progression of arterial disease and diabetes (POPADAD) trial: factorial randomised placebo controlled trial of aspirin and antioxidants in patients with diabetes and asymptomatic peripheral arterial disease. *BMJ* 2008;337:a1840
36. Baigent C, Blackwell L, Collins R, et al. Aspirin in the primary and secondary prevention of vascular disease: collaborative meta-analysis of individual participant data from randomised trials. *Lancet* 2009;373:1849-1860
37. Canadian Diabetes Association Clinical Practice Guideline Expert Committee. Physical activity and diabetes. In: Canadian Diabetes Association Clinical Practice Guideline Expert Committee, ed. Canadian Diabetes Association 2008 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada; 2008:S37-S39. Available from www.diabetes.ca
38. Canadian Diabetes Association Clinical Practice Guideline Expert Committee. Nutrition Therapy. In: Canadian Diabetes Association Clinical Practice Guideline Expert Committee, ed. Canadian Diabetes Association 2008 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada; 2008:S40-S45. Available from www.diabetes.ca
39. Appel LJ, Moore TJ, Obarzanek E, et al. A clinical trial of the effects of dietary patterns on blood pressure. DASH Collaborative Research Group. *N Engl J Med* 1997;336:1117-1124

40. Garriguet D. Sodium consumption at all ages. Statistics Canada – Health Reports May 2007;82
41. He FJ, MacGregor GA. Effect of longer-term modest salt reduction on blood pressure. Cochrane Database Syst Rev 2004;CD004937
42. Sodium reduction strategy for Canada, Recommendations of the sodium working group. 23
43. Effects of weight loss and sodium reduction intervention on blood pressure and hypertension incidence in overweight people with high-normal blood pressure. The Trials of Hypertension Prevention, phase II. The Trials of Hypertension Prevention Collaborative Research Group. Arch Intern Med 1997;157:657-667
44. Canadian Diabetes Association Clinical Practice Guideline Expert Committee. Management of obesity in diabetes. In: Canadian Diabetes Association Clinical Practice Guideline Expert Committee, ed. Canadian Diabetes Association 2008 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada; 2008:S77-S81. Available from www.diabetes.ca
45. Whelton SP, Chin A, Xin X, et al. Effect of aerobic exercise on blood pressure: a meta-analysis of randomized, controlled trials. Ann Intern Med 2002;136:493-503
46. Xin X, He J, Frontini MG, et al. Effects of alcohol reduction on blood pressure: a meta-analysis of randomized controlled trials. Hypertension 2001;38:1112-1117
47. Canadian Diabetes Association Clinical Practice Guideline Expert Committee. Psychological Aspects of Diabetes. In: Canadian Diabetes Association Clinical Practice Guideline Expert Committee, ed. Canadian Diabetes Association 2008 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada; 2008:S82-S85. Available from www.diabetes.ca
48. Newman S, Steed L, Mulligan K. Self-management interventions for chronic illness. Lancet 2004;364:1523-1537
49. Campbell N, Poirier L, G T, et al. 2011 Canadian Hypertension Education Program Recommendations: The Scientific Summary - An Update of the 2011 theme and the science behind new CHEP recommendations. In press 2011
50. Bosworth HB, Olsen MK, Neary A, et al. Take Control of Your Blood Pressure (TCYB) study: a multifactorial tailored behavioral and educational intervention for achieving blood pressure control. Patient Educ Couns 2008;70:338-347
51. Brown VA, Bartholomew LK, Naik AD. Management of chronic hypertension in older men: an exploration of patient goal-setting. Patient Educ Couns 2007;69:93-99
52. Street RL, Jr., Gordon HS, Ward MM, et al. Patient participation in medical consultations: why some patients are more involved than others. Med Care 2005;43:960-969
53. Anderson RM, Funnell MM. Patient empowerment: myths and misconceptions. Patient Educ Couns 2009;79:277-282
54. Canadian Diabetes Association Clinical Practice Guideline Expert Committee. Type 2 Diabetes in Aboriginal Peoples. In: Canadian Diabetes Association Clinical Practice Guideline Expert Committee, ed. Canadian Diabetes Association 2008 Clinical

Practice Guidelines for the Prevention and Management of Diabetes in Canada; 2008:S187-190. Available from www.diabetes.ca

55. Canadian Diabetes Association Clinical Practice Guideline Expert Committee. Type 2 Diabetes in High Risk Ethnic Populations. In: Canadian Diabetes Association Clinical Practice Guideline Expert Committee, ed. Canadian Diabetes Association 2008 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada; 2008:S191-193. Available from www.diabetes.ca
56. Bild D, Teutsch SM. The control of hypertension in persons with diabetes: a public health approach. Public Health Rep 1987;102:522-529

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