Hypertension in diabetes: A call to action

Norman RC Campbell MD1, Lawrence A Leiter MD2, Pierre Larochelle MD3, Sheldon Tobe MD4, Arun Chockalingam PhD5, Richard Ward MD6, Dorothy Morris MA CCNC7, Ross Tsuyuki PharmD MSc8

The Canadian Hypertension Education Program, Blood Pressure Canada, Canadian Hypertension Society, Heart and Stroke Foundation of Canada, Canadian Diabetes Association, College of Family Physicians of Canada, Canadian Pharmacists Association and the Canadian Council of Cardiovascular Nurses call on Canadian health care professionals to redouble efforts to help patients achieve treatment targets (blood pressure less than 130 mmHg systolic and less than 80 mmHg diastolic) in people with diabetes. Treatment of high blood pressure in people with diabetes results in large reductions in death and disability within a short period of time and needs to be a therapeutic priority. Achieving blood pressure targets requires sustained lifestyle modification, and three or more drugs including a diuretic are often required. Antihypertensive treatment in people with diabetes is one of the few medical treatments estimated to reduce overall health costs. The cost of treatment is less than the cost of complications prevented. Blood pressure needs to be assessed at all visits and home blood pressure assessment is encouraged. Management strategies need to include assessment and management of cardiovascular risks including smoking, unhealthy eating, physical inactivity, abdominal obesity, dyslipidemia as well as dysglycemia. The risks and benefits of acetylsalicylic acid in primary prevention of cardiovascular disease are uncertain in people with hypertension and diabetes. Intensive individualized lifestyle modification is recommended to prevent and treat hypertension, dyslipidemia, dysglycemia and other vascular risks in people with diabetes.

Key Words: Cardiovascular disease; Diabetes; Hypertension; Myocardial infarction prevention; Stroke

Hypertension et diabète : Appel à la mobilisation

Le Programme éducatif canadien sur l’hypertension (PECH), la Société canadienne de l’hypertension artérielle, la Fondation des malades du cœur du Canada, l’Association canadienne du diabète, le Collège des médecins de famille du Canada, l’Association des pharmaciens du Canada et le Conseil canadien des infirmières et infirmiers en soins cardiovasculaires demandent aux professionnels de la santé canadiens de redoubler d’efforts pour aider leurs patients diabétiques à atteindre leurs objectifs tensionnels (soit tension artérielle [TA] systolique < 130 mm Hg et TA diastolique < 80 mm Hg). Chez les personnes atteintes de diabète, le traitement de l’hypertension artérielle donne lieu à d’importantes réductions de la mortalité et de l’incapacité en peu de temps et doit constituer une priorité thérapeutique. L’atteinte des objectifs de tension artérielle exige des modifications soutenues au style de vie et il faut souvent administrer trois médicaments ou plus, dont un diurétique. Le traitement antihypertenseur chez les personnes atteintes de diabète est l’un des rares traitements médicaux jugés capables de réduire les coûts de santé globaux. Le traitement coûte moins cher que les complications qu’il prévient. La tension artérielle doit être mesurée à chaque visite médicale et il faut encourager la vérification de la tension artérielle à domicile. Les stratégies thérapeutiques doivent inclure une évaluation et une prise en charge des facteurs de risque cardiovasculaires, c.-à-d., tabagisme, alimentation malsaine, sédentarité, obésité abdominale, dyslipidémie et dysglycémie. Les risques et avantages de l’acide acétylsalicylique en prévention primaire de la maladie cardiovasculaire restent à déterminer chez les personnes souffrant d’hypertension et de diabète. On recommande une modification intensive et individualisée du style de vie pour prévenir et traiter l’hypertension, la dyslipidémie, la dysglycémie et autres risques vasculaires chez les personnes souffrant de diabète.

Increased blood pressure represents a major health risk to people with diabetes. Sixty per cent to 80% of people with diabetes die of cardiovascular complications and up to 75% of specific cardiovascular complications have been attributed to high blood pressure (Table 2) (8). Hypertension is also a major factor contributing to kidney failure and eye disease in people with diabetes (9,10). Unfortunately, even in a recent survey, two-thirds of Canadians with hypertension and diabetes had uncontrolled blood pressure (6).

Reducing vascular risk due to increased blood pressure: lifestyle change and improved self-efficacy

Hypertension and type 2 diabetes can be prevented. Blood pressure and hyperglycemia can be reduced and other cardiovascular risks can be improved by lifestyle interventions including a healthy diet, regular physical activity, low-risk alcohol consumption, reductions in dietary sodium and in some, stress reduction (Table 3). Brief health care professional interventions can increase the probability of a person making
lifestyle changes and more comprehensive interdisciplinary care approaches are more effective (11,12). Self-management and self-efficacy are encouraged through the use of home measurement of blood pressure (13). Home blood pressure readings better predict cardiovascular outcomes than office readings, can detect white coat hypertension and masked hypertension, may improve adherence to medications or lifestyle change, and result in improved blood pressures. However, a weakness of home measurement of blood pressure is the lack of studies in diabetic populations and hence, the absence of validated target blood pressures for people with diabetes. Home blood pressure targets likely should be less than the office target of less than 130/80 mmHg.

**REDUCING VASCULAR RISK DUE TO INCREASED BLOOD PRESSURE: PHARMACOTHERAPY**

Pharmacologically reducing blood pressure in people with diabetes is one of the most effective medical interventions available to reduce death and disability. Randomized controlled trials of blood pressure-lowering treatments in people with diabetes have demonstrated major reductions in death, cardiovascular disease, and eye and kidney disease over a short period in time (9,10,14-18). For example, in the Systolic Hypertension in Europe (Syst-Eur) trial of isolated systolic hypertension (systolic blood pressure greater than 160 mmHg, diastolic blood pressure less than 90 mmHg) (19), active treatment reduced total mortality by 55%, cardiovascular mortality by 76% and all cardiovascular events by 67% with a reduction in blood pressure of 9.8/3.8 mmHg. In the United Kingdom Prospective Diabetes Study (UKPDS) (14), more intensive lowering of blood pressure, even by a few mmHg, had a major effect in reducing cardiovascular death and disability in people with diabetes. In a meta-analysis (20) of randomized controlled trials of diabetic people with hypertension, more versus less intensive lowering of blood pressure reduced total mortality by 24% and major cardiovascular events by 25%. In the diabetes subgroup of the Hypertension Optimal Treatment (HOT) trial (21), people with diabetes who were assigned to have a target diastolic blood pressure below 80 mmHg were compared with those assigned to have a target blood pressure below 90 mmHg. Although the achieved blood pressure difference in the two groups at the end of the study was only 4 mmHg, this greater reduction in blood pressure resulted in a 66% reduction in death from heart disease and stroke (21). The use of an angiotensin-converting enzyme (ACE) inhibitor or angiotensin receptor blocker (ARB)-based therapeutic regime to lower blood pressure has additional advantages in people with chronic kidney disease and micro- or macroalbuminuria (20).

**COMBINING THERAPIES TO REDUCE BLOOD PRESSURE**

Combinations of lifestyle modification and sometimes four or more drugs are required for blood pressure control (22). An ACE inhibitor or ARB is a potential first-line therapy in all people with hypertension and diabetes (23). Alternative first-line treatments include long-acting calcium channel blockers and low-dose diuretics in people without microalbuminuria (23). Diuretic therapy is markedly underutilized in people with hypertension and diabetes but is generally considered necessary for blood pressure control when multiple antihypertensive drugs are prescribed (24,25). Diuretic therapy reduces major cardiovascular events in hypertensive people with or at risk for diabetes to a similar extent to other first-line drugs such as long-acting calcium channel blockers or ACE inhibitors (26). Often, higher doses of diuretic are required in resistant hypertension (27). Maintaining a normal serum potassium level is important to minimize the effect of diuretics on blood glucose and to maximize cardiovascular event reductions (28,29). Long-acting calcium channel blockers and cardioselective beta-blockers need to be considered if the blood pressure remains above target. A combination tablet of an ACE inhibitor or ARB with a diuretic, and a long-acting calcium channel blocker and a long-acting beta-blocker makes a potent once a day, three-tablet, four-drug blood pressure-lowering combination. The combination of an ACE inhibitor and an ARB has more adverse effects than ACE inhibitor therapy on its own and has no therapeutic advantage (30,31); hence, it is specifically not recommended to be used in the presence of normal urinary albumin levels (trials are ongoing to determine if the combination has a therapeutic role in

### Table 1

<table>
<thead>
<tr>
<th>Complication</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td>Fasting plasma glucose of 7 mmol/L, or casual plasma glucose of 11.1 mmol/L or higher with symptoms of diabetes, or 2 h post-glucose load plasma glucose of 11.1 mmol/L or higher</td>
</tr>
<tr>
<td>Hypertension in people with diabetes</td>
<td>Systolic blood pressure ≥130 mmHg or diastolic blood pressure ≥80 mmHg</td>
</tr>
</tbody>
</table>

Data from reference 7

### Table 2

<table>
<thead>
<tr>
<th>Complication</th>
<th>Proportion attributable to hypertension, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke</td>
<td>75</td>
</tr>
<tr>
<td>Coronary artery disease</td>
<td>35</td>
</tr>
<tr>
<td>End-stage renal disease</td>
<td>50</td>
</tr>
<tr>
<td>Eye disease†</td>
<td>35</td>
</tr>
<tr>
<td>Leg amputation</td>
<td>35</td>
</tr>
</tbody>
</table>

*Hypertension defined as ≥160/95 mmHg and ≥140/90 mmHg in different studies; † Defined as retinopathy. Data from reference 48

### Table 3

**Lifestyle therapy to reduce the risk of blood pressure-related cardiovascular complications in hypertension**

**Healthy diet**

High in fresh fruits, vegetables, low-fat dairy products, dietary and soluble fibre, whole grains and protein from plant sources, low in saturated fat, cholesterol and salt in accordance with Canada’s Guide to Healthy Eating

**Regular physical activity**

Accumulation of 30 min to 60 min of moderate intensity dynamic exercise 4 to 7 days per week in addition to daily activities.

**Low-risk alcohol consumption**

≤2 standard drinks/day, and less than 14/week for men and less than 9/week for women. One standard drink is a glass of wine (5 oz/142 mL of 12% alcohol content), one beer (12 oz/341 mL of 5% alcohol) or one shot of spirits (1.5 oz/43 mL of 40% alcohol)

**Attaining and maintaining ideal body weight**

Body mass index 18.5 kg/m² to 24.9 kg/m²

**Attaining and maintaining healthy waist circumference**

European <102 cm for men, <88 cm for women

Japanese, South Asian, <90 cm for men, <80 cm for women

**Reduction in sodium intake**

Less than 2300 mg/day

**A smoke-free environment**

**Stress reduction**

In people in whom stress may be contributing to blood pressure elevation, stress management should be considered

*With permission from the Canadian Hypertension Education Program*
the presence of proteinuria). Although multiple drugs are required for control, more intensive lowering of blood pressure in people with diabetes is one of very few cost-saving medical interventions (32). The cost of blood pressure lowering is actually less than the cost of the complications prevented. Further quality of life can improve with more intensive blood pressure lowering (33).

REDUCING OVERALL VASCULAR RISK IN PEOPLE WITH DIABETES

Although hypertension is a leading risk in people with diabetes, other health risks are also very important. Dyslipidemia has a large impact in reducing cardiovascular events and a meta-analysis (34) of statin-based lipid lowering therapy in diabetes revealed that every 1 mmol reduction in low-density lipoprotein cholesterol was associated with a 9% reduction in total mortality, 13% reduction in cardiovascular mortality and 21% reduction in major cardiovascular events. Smoking is a risk for the development of diabetes mellitus (35), and a major risk for not only cardiovascular disease and cancer but also nephropathy and retinopathy in the person with diabetes. Interventions for smoking cessation can reduce mortality rates by almost 20% (36). Diabetes is defined by elevated blood glucose levels, and interventions to reduce glucose have resulted in reductions in nephropathy (albuminuria) and reduced development and progression of retinopathy (37-39). The Canadian Diabetes Association recommends reducing blood glucose levels to achieve a glycosylated hemoglobin target of 7.0% or less and consideration of reducing glycosylated hemoglobin to 6.5% or less (7). Current evidence is unclear as to the role of acetylsalicylic acid (ASA) in people with diabetes and hypertension. In the HOT trial (21), hypertensive diabetic people benefited from ASA therapy with reduced cardiovascular events. However, there is a lack of benefit of ASA therapy in the primary prevention of cardiovascular disease in other studies of people with diabetes (40-42). A comprehensive program that included lifestyle and pharmacotherapy for multiple risk factors has been associated with a 40% reduction in total mortality highlighting the importance of integrated programs that assess and address all cardiovascular risks (43). Focusing efforts on improving lifestyle and proven therapies to reduce blood pressure could have a huge impact on the longevity and disability of people with diabetes. Unfortunately, practice surveys demonstrate inadequate use of proven therapies, especially antihypertensive and statin therapies, in people with diabetes (44-46).

MANAGING HYPERTENSION IN PEOPLE WITH DIABETES: A CANADIAN CARE GAP

The recent Ontario Heart and Stroke Foundation blood pressure survey demonstrated a marked improvement in blood pressure control in hypertensive people with and without diabetes (24). The improved treatment of hypertension in Canada has been associated with a marked reduction in death and hospitalization from cardiovascular disease (47). However, the control of blood pressure in those with diabetes is worse than those without diabetes even using a 140/90 mmHg threshold, and two-thirds of people with diabetes had blood pressures of 130/80 mmHg or greater (24). In diabetic people with uncontrolled blood pressure, 27% were not treated and only 45% of those on multiple drugs were prescribed a diuretic (24). The Ontario survey indicates substantive improvement in blood pressure control is required in people with diabetes, which if implemented, will result in large reductions in death and disability rates, and health care costs.

A CALL TO ACTION: TARGET BLOOD PRESSURE TO LESS THAN 130/80 mmHg IN PEOPLE WITH DIABETES

The Canadian Hypertension Education Program, Blood Pressure Canada, Canadian Hypertension Society, Heart and Stroke Foundation of Canada, Canadian Diabetes Association, College of Family Physicians of Canada, Canadian Pharmacists Association and Canadian Council of Cardiovascular Nurses call on Canadian health care professionals and people with diabetes to redouble efforts to help patients achieve treatment targets and ensure:

• Blood pressure is maintained at less than 130 mmHg systolic and less than 80 mmHg diastolic. Sustained lifestyle modification and three or more drugs including a diuretic may be required.
• Blood pressure is assessed at all health care professional visits and that home blood pressure assessment is encouraged.
• Assessment and management of cardiovascular risks including smoking, unhealthy eating, physical inactivity, abdominal obesity, dyslipidemia and dyglycemia is required.
• Intensive individualized lifestyle modification is used to prevent and treat hypertension, dyslipidemia, dysglycemia and other vascular risks.
• Self-management education is encouraged including home measurement of blood pressure.

REFERENCES

2. Vasan RS, Beiser A, Seshadri S, et al. Residual lifetime risk for the development of diabetes mellitus (35), and a major risk for not only cardiovascular disease and cancer but also nephropathy and retinopathy in the person with diabetes. Interventions for smoking cessation can reduce mortality rates by almost 20% (36). Diabetes is defined by elevated blood glucose levels, and interventions to reduce glucose have resulted in reductions in nephropathy (albuminuria) and reduced development and progression of retinopathy (37-39). The Canadian Diabetes Association recommends reducing blood glucose levels to achieve a glycosylated hemoglobin target of 7.0% or less and consideration of reducing glycosylated hemoglobin to 6.5% or less (7). Current evidence is unclear as to the role of acetylsalicylic acid (ASA) in people with diabetes and hypertension. In the HOT trial (21), hypertensive diabetic people benefited from ASA therapy with reduced cardiovascular events. However, there is a lack of benefit of ASA therapy in the primary prevention of cardiovascular disease in other studies of people with diabetes (40-42). A comprehensive program that included lifestyle and pharmacotherapy for multiple risk factors has been associated with a 40% reduction in total mortality highlighting the importance of integrated programs that assess and address all cardiovascular risks (43). Focusing efforts on improving lifestyle and proven therapies to reduce blood pressure could have a huge impact on the longevity and disability of people with diabetes. Unfortunately, practice surveys demonstrate inadequate use of proven therapies, especially antihypertensive and statin therapies, in people with diabetes (44-46).

Can J Cardiol Vol 25 No 5 May 2009

301


