

1. Methods and an overview of the Canadian recommendations

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Abstract

Objective: To provide updated, evidence-based recommendations for health care professionals on lifestyle changes to prevent and control hypertension in otherwise healthy adults (except pregnant women).

Options: For people at risk for hypertension, there are a number of lifestyle options that may avert the condition — maintaining a healthy body weight, moderating consumption of alcohol, exercising, reducing sodium intake, altering intake of calcium, magnesium and potassium, and reducing stress. Following these options will maintain or reduce the risk of hypertension. For people who already have hypertension, the options for controlling the condition are lifestyle modification, antihypertensive medications or a combination of these options; with no treatment, these people remain at risk for the complications of hypertension.

Outcomes: The health outcomes considered were changes in blood pressure and in morbidity and mortality rates. Because of insufficient evidence, no economic outcomes were considered.

Evidence: A MEDLINE search was conducted for the period January 1966 to September 1996 for each of the interventions studied. Reference lists were scanned, experts were polled, and the personal files of the authors were used to identify other studies. All relevant articles were reviewed, classified according to study design and graded according to level of evidence.

Values: A high value was placed on the avoidance of cardiovascular morbidity and premature death caused by untreated hypertension.

Benefits, harms and costs: Lifestyle modification by means of weight loss (or maintenance of healthy body weight), regular exercise and low alcohol consumption will reduce the blood pressure of appropriately selected normotensive and hypertensive people. Sodium restriction and stress management will reduce the blood pressure of appropriately selected hypertensive patients. The side effects of these therapies are few, and the indirect benefits are well known. There are certainly costs associated with lifestyle modification, but they were not measured in the studies reviewed. Supplementing the diet with potassium, calcium and magnesium has not been associated with a clinically important reduction in blood pressure in people consuming a healthy diet.

Recommendations: (1) It is recommended that health care professionals determine the body mass index (weight in kilograms/[height in metres]²) and alcohol consumption of all adult patients and assess sodium consumption and stress levels in all hypertensive patients. (2) To reduce blood pressure in the population at large, it is recommended that Canadians attain and maintain a healthy body mass index. For those who choose to drink, alcohol intake should be limited to 2 or fewer standard drinks per day (maximum of 14/week for men and 9/week for women). Adults should exercise regularly. (3) To reduce blood pressure in hypertensive patients, individualized therapy is recommended. This therapy should emphasize weight loss for overweight patients, abstinence from or moderation in alcohol intake, regular exercise, restriction of sodium intake and, in appropriate circumstances, individualized cognitive behaviour modification to reduce the negative effects of stress.

Validation: The recommendations were reviewed by all of the sponsoring organizations and by participants in a satellite symposium of the fourth International Conference on Preventive Cardiology. They are similar to those of the World Hypertension League and the Joint National Committee, with the exception of the recommendations on stress management, which are based on new information. They have not been clinically tested.

Sponsors: The Canadian Hypertension Society, the Canadian Coalition for High Blood Pressure Prevention and Control, the Laboratory Centre for Disease Control at Health Canada, and the Heart and Stroke Foundation of Canada.

Special supplement

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Hypertension affects approximately 22% of Canadian adults.¹ The incidence of hypertension increases with age, and most elderly Canadians have high blood pressure.¹ Hypertension is an enormous public health issue, because it is a reversible risk factor for stroke, ischemic heart disease, congestive heart failure, renal failure and peripheral vascular disease. There is now general agreement that cardiovascular disease can be prevented by altering diet and lifestyle and by reducing risk factors such as hypertension.²

The 1992 *Victoria Declaration on Heart Health*² advised that a public health approach to the prevention and control of cardiovascular disease be adopted, one that promotes healthy dietary habits, a tobacco-free lifestyle, regular physical activity and a supportive psychosocial environment. Health care professionals play a vital role in the promotion and success of this approach, because they interact on a regular basis with a large proportion of the population and are well placed to counsel individual patients.

In 1989 the Canadian Coalition for High Blood Pressure Prevention and Control and the Canadian Hypertension Society developed consensus recommendations for lifestyle modification to prevent and treat hypertension.³ However, few Canadians with high blood pressure became aware of these recommendations,⁴ probably because the guidelines were poorly disseminated and because health care professionals adopted them to only a limited extent. Even when professionals were aware of the recommendations, there were limited resources for implementation, and patients failed to adhere to them.

An objective of the recommendations presented here is to increase awareness of the value of lifestyle modification in preventing and controlling hypertension. To meet this objective, the Canadian Hypertension Society, the Canadian Coalition for High Blood Pressure Prevention and Control, the Laboratory Centre for Disease Control at Health Canada, and the Heart and Stroke Foundation of Canada have revised and updated the previous recommendations³ using an evidence-based approach.

Lifestyle modification is a suitable primary therapy for patients with mild hypertension (i.e., blood pressure greater than 140/90 mm Hg¹) and is a suitable adjunct to pharmacologic therapy. Furthermore, lifestyle modification may prevent increases in blood pressure and the development of hypertension in people at risk, and such changes may be applicable to population-based interventions.

Methods

An Organizing Committee was formed with representatives from the Canadian Hypertension Society (E.B.), the Canadian Coalition for High Blood Pressure Prevention and Control (N.R.C.C.), the Laboratory Centre for Disease Control at Health Canada (G.T.) and the Heart and Stroke Foundation of Canada (E.W.). On the basis of extensive research into the factors that con-

tribute to hypertension and those that prevent and control hypertension, the Organizing Committee chose to focus on weight loss, alcohol consumption, exercise, salt reduction, ion supplementation (calcium, magnesium and potassium) and stress reduction.

Treatment with antihypertensive medications is the primary alternative to lifestyle modification for treating hypertension. Canadian guidelines on the use of antihypertensive medications⁵ are currently being revised.

The major outcomes considered were changes in blood pressure and in morbidity and mortality rates. Economic outcomes were not considered because of insufficient research in that area.

Each of the 6 selected lifestyle areas was represented by a panel. The panel members and chairs were suggested by the executive committees of the Canadian Coalition for High Blood Pressure Prevention and Control and the Canadian Hypertension Society in September 1996. The Organizing Committee selected for panel membership health care professionals who would be affected by the guidelines as well as people with public health expertise and research interests in these areas.

The panels obtained evidence examining the association between each lifestyle modification and blood pressure in adults (except pregnant women) first by using MEDLINE searches, for which the specific dates and search terms are given in the individual reports. References cited in articles found through the literature search were also reviewed. Subject experts and the authors of some of the articles identified were asked to supply additional references, and panel members searched their personal files for relevant materials. The articles were classified according to study design and were reviewed individually. No other specific quality criteria were used to select or exclude articles. The evidence and recommendations were graded with a system used by the Canadian Hypertension Society (Tables 1 and 2).⁵

The working panels met in January 1997 to critically evaluate the literature that had been gathered and to develop preliminary recommendations. The evidence and recommendations were presented to the members of the other panels, and the recommendations were revised after discussion. Major Canadian organizations (Table 3) with an interest in cardiovascular disease were asked to review the revised recommendations. Appropriate comments were incorporated after discussion by the members of the relevant panel, and a second revision was produced. These second revisions were circulated to the members of all panels for comment, and the recommendations and evidence were then presented at a satellite symposium of the fourth International Conference on Preventive Cardiology in July 1997 for national and international input. Any panel member who had a different opinion on some aspect of his or her panel's recommendations was given the opportunity to voice concerns in the Interpretation section of the particular manuscript.

Results

The panels adopted the following recommendations. To prevent and treat hypertension, certain lifestyle and dietary habits of all adult patients should be routinely assessed (Table 4). The recommendations for preventing high blood pressure are given in Table 5, and the recommendations for treating high blood pressure are shown in Table 6. The evidence supporting the recommendations for each lifestyle modification was reviewed by the respective panel and is presented separately.

Interpretation

Health care professionals can help their patients by checking blood pressure at every opportunity and by counselling patients and their families about preventing hypertension. All patients would benefit from general advice on healthy lifestyle habits, in particular healthy body weight, moderate consumption of alcohol and regular exercise. Because the risk of cardiovascular disease rises with blood pressure throughout the normotensive blood pressure range, patients with normal blood pressure may also benefit from lifestyle modification.⁶ It has been estimated, for example, that lowering the median blood pressure of the population by 2 mm Hg could be more effective in reducing the rate of cardiovascular disease than medically treating individual patients who have diastolic blood pressure greater than 95 mm Hg.⁷ Several of the recommendations presented here, such as maintaining ideal body weight, ex-

ercising regularly and reducing stress, may delay the onset of or prevent cardiovascular disease, independent of their effects in reducing blood pressure. Reducing blood pressure and the risk of cardiovascular disease by changing lifestyle habits could decrease the cost of health care by decreasing the use of pharmacologic and invasive cardiovascular treatments.^{2,8,9}

Lifestyle advice can be tailored to individual patients. Some changes may be more appropriate for certain people. For example, weight loss is more likely to benefit people who are obese. Research has not addressed which lifestyle changes are preferred by patients, but such information would influence the way in which advice could be tailored to the individual. For some patients, a single change may be appropriate, whereas for others, several changes may be advisable.

Table 7 provides summaries of randomized controlled trials in which multiple, simultaneous lifestyle modifications were made to prevent hypertension in people with normal blood pressure.^{10–14} Table 8 summarizes those in which multiple, simultaneous interventions were used to treat hypertension.^{15,16} The strength of these trials is that they used meaningful endpoints, such as the development of hypertension or avoidance of antihypertensive medication. However, there were some limitations. To a large extent the subjects were highly selected (usually white, educated men who adhered to the interventions), and in some studies the endpoints were retrospective, the statistical analyses were unclear, the endpoint was determined arbitrarily by nonstudy physicians prescribing drug treatment, or the analysis was restricted to a subgroup of patients. De-

Table 2: Grading system for recommendations*

Rank	Description
A	The recommendation is based on one or more level I studies
B	The best evidence available was at level II
C	The best evidence available was at level III
D	The best evidence available was ranked lower than level III and included expert opinion

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Table 3: Organizations that received draft recommendations for review*

AMG Medical Inc.
 Atlantic Cardiovascular Health Association
 Bayer Inc.
 Bristol-Myers Squibb Pharmaceutical Group
 Canadian Cardiovascular Society
 Canadian Council of Cardiovascular Nurses
 Canadian Council on Smoking and Health
 Canadian Diabetes Association
 Canadian Hypertension Society
 Canadian Medical Association
 Canadian Nurses Association
 Canadian Pediatric Society
 Canadian Pharmacists Association
 Canadian Public Health Association
 Canadian Stroke Society
 College of Family Physicians of Canada
 Dietitians of Canada
 Health Canada, Disease Prevention Division
 Health Canada, Laboratory Centre for Disease Control
 Heart and Stroke Foundation of Canada
 Hoechst Marion Roussel Canada
 Merck Frosst Canada Inc.
 Parke Davis Canada
 Pfizer Canada Inc.
 Searle Canada Inc.
 Servier Canada Inc.

*Not all organizations commented on the draft recommendations.

Table 4: Recommendations to assess lifestyle and dietary habits

Recommendation	Grade
Determine the weight, height and body mass index of hypertensive patients	D
Determine the alcohol consumption of all adult patients	D
Determine the salt consumption of hypertensive patients	D
Consider the contribution of stress in hypertensive patients	D

Table 5: Recommendations to prevent hypertension

Recommendation	Grade
All adults should attain and maintain a healthy body mass index	B
Alcohol consumption should be in accordance with Canadian low-risk drinking guidelines (i.e., healthy adults should limit alcohol consumption to 2 drinks or fewer per day, and consumption should not exceed 14 standard drinks per week for men and 9 standard drinks per week for women)	B
All adults should be encouraged to participate in regular, moderately intense (40% to 60% of maximal oxygen consumption) physical activity for 50–60 minutes, 3 or 4 times per week	B

spite these limitations, the data consistently support multiple lifestyle changes to prevent hypertension or, in some patients, to replace antihypertensive therapy.

Two studies that were not published at the time the panels reviewed the literature and that therefore could not be included in these recommendations merit discussion. In the Dietary Approaches to Stop Hypertension (DASH) study¹⁷ the blood pressure of 459 untreated hypertensive patients and people with normal blood pressure was significantly reduced after 8 weeks of a dietary intervention. The people in this study followed 1 of 3 diets: a diet rich in fruits and vegetables, a diet low in fat, or a diet low in fat and rich in fruit and vegetables. This approach requires further research. In the Trial of Nonpharmacologic Intervention in the Elderly (TONE), weight loss, sodium restriction, and combined weight loss and sodium restriction were effective replacements for pharmacologic therapy in elderly hypertensive patients.¹⁸⁻²⁰ Unfortunately, at the time the panels were reviewing the literature the TONE data were available only in abstract form¹⁸ and therefore were not appropriate for evaluation.

Dissemination and implementation strategies

The public needs to be made aware of the risks of unhealthy lifestyles and the benefits of change. These recommendations should therefore be disseminated to health care professionals, patients and the general public.

Resources need to be developed at a local level to provide counselling to patients and to monitor the advice they are given. A philosophical switch is required whereby more resources would be invested in maintaining health and promoting lifestyle changes.

Public policy promoting good health is a vital component of the comprehensive approach required to support and encourage lifestyle changes. Public policy can be implemented at all levels of government and can affect both workplaces and public places. Through legislation, public policy produces such benefits as smoke-free public spaces and green spaces in communities. One public policy that

promotes good nutrition is the Health Check program of the Heart and Stroke Foundation of Canada. This program identifies and labels food products, providing easy-to-use guidance for the public in choosing foods that are part of a healthy diet. This is a simple way of creating a supportive environment in which healthier lifestyle choices are easier to make. There are, however, many other aspects of lifestyle where public policy could be supportive. Governments must be encouraged, by health care professionals and the public, to act in these areas.

The Organizing Committee plans to disseminate these recommendations through a series of publications and on the Web sites of the many organizations involved in their development. In addition, radio and television announcements or programs should be used to increase public awareness.

In 1998 plans for implementing these recommendations and other Canadian blood pressure guidelines were developed, and this process is continuing. The success of these recommendations will depend on the degree to which they are adopted and used by physicians, nurses, dietitians, pharmacists, psychologists, other health care professionals and health-related organizations, such as the Heart and Stroke Foundation of Canada. It will also depend on the provision of adequate resources by provincial and local health authorities.

Future research implications

There are some serious limitations to both the published research on the use of lifestyle management to reduce blood pressure and the methods used to assess this evidence. The most serious limitation of current research is the outcome measures that have been used. Most trials have focused on reducing blood pressure, whereas only a few have examined endpoints that are meaningful to patients, such as the prevention of hypertension and thus the avoidance of pharmacologic therapy, the replacement of pharmacologic therapy in those previously treated, the development of cardiovascular disease and early death. Data

Table 6: Recommendations for lifestyle modification to treat high blood pressure

Recommendation	Grade
Weight loss should be encouraged for all overweight patients; even moderate weight loss (i.e., 4.5 kg in obese, hypertensive patients) can improve blood pressure	B
Alcohol consumption should be in accordance with Canadian low-risk drinking guidelines (i.e., healthy adults should limit alcohol consumption to 2 drinks or fewer per day, and consumption should not exceed 14 standard drinks per week for men and 9 standard drinks per week for women)	C
All adults should be encouraged to participate in regular, moderately intense (40% to 60% of maximal oxygen consumption) physical activity for 50–60 minutes, 3 or 4 times per week	B
Patients should be advised to choose foods low in salt, to avoid salty foods and to minimize the use of salt at the table and during cooking	D
In selected patients with hypertension in whom stress appears to be a significant factor, individualized cognitive behaviour interventions should be advised	B

on the degree to which changes in lifestyle reduce morbidity and mortality rates is lacking. To date, there have been no randomized controlled trials of lifestyle modification to treat or prevent hypertension that have also examined rates of illness and death. The demonstration by such studies of significant effects on morbidity and mortality rates would be a major incentive to implement lifestyle measures to treat and prevent hypertension.

The second limitation of our work has to do with the levels of evidence used to develop the recommendations. A substantial proportion of current lifestyle research is epidemiologic. Current systems for grading the evidence of

treatment effects have no evidence-based way to evaluate the validity of different study designs, and some even ignore epidemiologic studies altogether.⁵ Although it is accepted that associations found in epidemiologic studies do not prove causality or the benefits of interventions, these studies may be more reliable than some clinical study designs (e.g., case series).

The inability to objectively grade epidemiologic evidence and evidence from other clinical study designs represents a glaring deficit. It should be possible to assess the reliability of epidemiologic studies in relation to well-designed randomized controlled trials (which repre-

Table 7: Randomized controlled trials with simultaneous lifestyle interventions to prevent hypertension in people with normal blood pressure

Study design	Subjects	Intervention	Duration	Endpoint	Study limitations
Parallel ^{10,11}	385 men, 179 women; 30–54 yr; baseline BP 80–89 mm Hg	Reduced caloric and alcohol intake; increased activity	18 mo	RR of hypertension = 0.49 (95% CI 0.29–0.83)	Retrospective analysis; highly selected patients; analysis difficult to verify
Parallel ¹²	174 men, 27 women; 30–44 yr; baseline BP 85–89 mm Hg or 80–84 mm Hg; weight 110%–139% of ideal; resting pulse > 80 BPM	Reduced caloric, sodium and alcohol intake; increased activity	5 yr	RR of hypertension = 0.46, $p = 0.027$	Highly selected patients; diagnosis of hypertension not standardized
Parallel ¹³	541 men, 292 women; 25–49 yr; baseline BP > 78 and < 89 mm Hg	1. Reduced caloric and sodium intake 2. Reduced sodium, increased potassium intake	3 yr	1. RR of hypertension = 0.812 2. RR of hypertension = 0.65	Definition of hypertension not clinically relevant; highly selected patients; ineffective weight loss regimen; incomplete statistical analysis
2 × 2 factorial ¹⁴	1485 men, 765 women; 30–54 yr; baseline BP 83–89 mm Hg; body weight 110%–165% of ideal	1. Weight loss (reduced caloric intake, increased physical activity) 2. Reduced sodium intake 3. Both 1 and 2	4 yr	RR of hypertension 1. Weight loss RR = 0.87, $p = 0.06$ 2. Sodium restriction RR = 0.86, $p = 0.04$ 3. Combined intervention RR = 0.85, $p = 0.02$	Highly selected patients

Note: BP = blood pressure, RR = relative risk, CI = confidence interval, BPM = beats per minute.

Table 8: Randomized controlled trials substituting simultaneous lifestyle interventions for pharmacologic therapy in hypertensive patients

Study design	Patients	Intervention	Duration	Endpoint	Study limitations
Parallel ¹⁵	120 men, 69 women; age > 35 yr; baseline BP 120/78.2 mm Hg	Reduced sodium, caloric and alcohol intake; discontinued pharmacologic therapy	4 yr	39% of intervention group and 5% of control group did not require pharmacologic therapy (RR = 7.8, $p < 0.001$)	Highly selected patients; small trial; alcohol intervention ineffective
Parallel ¹⁶	Untreated Japanese patients; 53 men, 58 women; baseline BP 140–179/90–109 mm Hg	Reduced sodium, alcohol and sugar intake; increased milk intake; increased activity	18 mo	91% of intervention group and 76% of control group did not require pharmacologic therapy (RR = 1.2, $p = 0.02$)	Endpoint for initiating pharmacologic therapy was not standardized

sent level I evidence) and other study designs. There is a pressing need to develop an objective, evidence-based scheme for grading all types of evidence.²¹ This would improve our current guideline methodology.

Support for research

Pharmaceutical companies deserve recognition for their investment in this process to improve the health of Canadians, to find alternatives to drug therapy and to reduce drug use. The positive influence of the Canadian pharmaceutical industry on health, beyond the development of new pharmaceutical products, must be discussed, encouraged and recognized.

Conclusion

The development of the recommendations presented in this supplement was possible only through the cooperation of many organizations. Care was taken to ensure that these recommendations are compatible with an overall improvement in health and do not lead simply to a reduction in blood pressure. The panels found no evidence that harm would come to patients who followed these recommendations. The broad application of these recommendations is strongly encouraged because of the beneficial effect they could have on overall mortality rates, as well as on cardiovascular disease, osteoporosis, alcohol-related violence and certain cancers. However, as for all general recommendations, the physician must consider each patient individually and assess the risks and benefits of every therapy before providing advice.

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