Guideline CPD

Canadian Cardiovascular Harmonized National Guideline Endeavour (C-CHANGE) guideline for the prevention and management of cardiovascular disease in primary care: 2022 update

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The goal of the Canadian Cardiovascular Harmonized National Guideline Endeavour (C-CHANGE) process is to give all Canadian health care providers easy access to a comprehensive and practical set of harmonized guideline recommendations. Clinicians claim that there are too many guidelines with too many individual recommendations to be practical and accessible for primary care; that their patients' multimorbidity requires them to access many guidelines at the same time; and that at least in the past, some of the recommendations were not harmonized and seemed contradictory.[1]

Established in 2008 to address these issues, C-CHANGE produces a guideline that is a subset of recommendations chosen from guidelines developed by Canada's cardiovascular-focused guideline groups. It is designed to help clinicians formulate comprehensive treatment plans for use by all members of the health care team to address multimorbidity, as recommended by the *Canadian Heart Health Strategy and Action Plan*.[2] This fourth update was necessitated by recent changes to the guidelines included in previous updates and the addition of guidelines from 3 guideline groups new to the C-CHANGE process (Canadian Cardiovascular Society/Canadian Heart Rhythm Society guideline for the management of atrial fibrillation, Health Canada's Dietary Guideline and the Canadian Consensus Conference on Diagnosis and Treatment of Dementia) (Appendix 1, available at www.cmaj.ca/lookup/doi/10.1503/cmaj.220138/tab-related-content), thus increasing the comprehensiveness from the 2011,[1] 2014[3] and 2018[4] versions to a total of 11 guideline groups.

Key points

- This updated C-CHANGE guideline is a subset of recommendations chosen from guidelines from 11 of Canada's cardiovascular-focused guideline groups, expanded to include Health Canada's dietary guideline, the Canadian Consensus Conference on Diagnosis and Treatment of Dementia and the Canadian Cardiovascular Society/Canadian Heart Rhythm Society guideline for the management of atrial fibrillation.
- The 2022 C-CHANGE update includes a total of 83 recommendations, of which 48 are new or revised.
- Multifaceted care for patients with cardiovascular risk includes the cornerstones of health behaviour change: healthy eating, regular physical activity and exercise, healthy body weight, stress management, reduced alcohol intake and smoking cessation.
- Cardiovascular disease prevention is foundational to primary care practice and incorporates appropriate risk screening and risk stratification.
- Cardiovascular disease management combines guideline-directed health behaviour change and pharmacologic therapies to reduce symptoms, burden of disease, complications and residual cardiovascular risk.

The Global Burden of Diseases survey identified that the risk factors accounting for the largest percentage of disability-adjusted life-years in Canada included tobacco use, dietary factors, high body mass index (BMI), high fasting blood glucose,

increased systolic blood pressure, elevated cholesterol, alcohol and drug use, and low physical activity.[5] These risk factors frequently cluster, and their joint management is key for the prevention of and recovery from acute cardiovascular diseases, highlighting the need for a multimorbidity approach for chronic diseases. The importance of renewed attention to these risk factors is shown by the negative cardiovascular consequences of delayed treatment during the COVID-19 pandemic, heightening the importance of accessible, timely, equitable and comprehensive care.[6]

C-CHANGE specifically chooses implementable or actionable recommendations for primary care and helpful tools to organize how patient care is approached in clinic during periodic health and episodic visits (i.e., preventive strategies, screening, diagnostics and treatment). The recommendations are organized to address and individualize the management of patients with multiple comorbidities. This approach is inclusionary, nonjudgmental and unbiased, and focuses on the complexities of delivering comprehensive cardiovascular disease care in a primary care environment. Users of this guideline are encouraged to identify the individual root causes of cardiovascular risk and disease, complications and barriers to treatments, and to follow a patient-centred approach, including patient-identified health goals that incorporate the patient's values.[7] The C-CHANGE guideline also facilitates the discussion of treatment options beyond pharmacotherapy, including nutrition and physical activity, and procedural and psychological interventions.

Scope

The goal of C-CHANGE is to assist health care providers in managing patients who often have multiple cardiovascular comorbidities, through the initiation and implementation of individualized atherosclerotic cardiovascular disease (ASCVD) risk reduction strategies, based on their expert knowledge of their patient's preferences, goals and values. Although the main audience for this guideline update is primary care providers, many other specialists and members of the interprofessional team who manage patients with multiple cardiovascular disease comorbidities — such as atrial fibrillation, diabetes, hypertension, dyslipidemia, heart failure and obesity — may also find this guideline useful and relevant.

Recommendations

Recommendations selected from the 11 included guidelines have been organized into 4 groupings. The recommendations are ordered to consider the progression of pathology, from primary prevention to the effects of comorbidities and other risk factors, to target organ damage. The first grouping describes health behaviours for all patients, with subsections for dietary, physical activity and exercise, and smoking cessation (Table 1). Recognizing that obesity underlies many of the cardiovascular risk factors discussed, recommendations on obesity are paired with the adiposity-related diseases of diabetes and hypertension (Table 2). Recommendations for people with dyslipidemia, ASCVD or heart failure are grouped together (Table 3), as are recommendations for those with atrial fibrillation, stroke or dementia (Table 4).

Recommendations are clustered into subsections where appropriate for diagnostic strategies, treatment targets, and pharmacologic or procedural therapies. For each of the 83 recommendations (48 of which are new or revised), the source guideline is identified in conjunction with the strength of the recommendation and the level of evidence (Tables 1–4). As the guideline groups use different grading methodologies, the grading schemes are summarized in Appendix 2a (available at www.cmaj.ca/lookup/doi/10.1503/cmaj.220138/tab-related-content), with a comparison of the different grading schemes used in the recommendations (Appendix 2b) and a summary of the details of the grade methodology (Appendix 2c). The supporting text highlights many of the important updates and new recommendations.

Recognizing the importance of depression in the management and prevention of ASCVD, we have included additional information that emphasizes this linkage and a pragmatic evidence-informed approach to depression management.

Health behaviours applicable to all

Health behaviour change remains the foundation of the C-CHANGE guideline and should be prescribed to all individuals (Table 1). Health Canada's Dietary Guideline recommends water as the preferred beverage of choice, avoiding sugar-sweetened beverages.[8] The Global Burden of Diseases Nutrition and Chronic Diseases Expert Group found, for example, that individuals consuming 1 to 2 servings of sugar-sweetened beverages per day had a 26% greater risk of developing type 2 diabetes (risk ratio [RR] 1.26, 95% confidence interval [CI] 1.12 to 1.41) than those who consume less than 1 serving per month.[21]

Starting physical activity at any level compared with remaining inactive provides the greatest increment in health benefits, and there are important health benefits even at a lower volume or intensity of physical activity.[22] For example, individuals active at half the current recommendations compared with inactive individuals (e.g., those reporting no leisure-time physical activity) still had a 14% lower risk of coronary artery disease (RR 0.86, 95% CI 0.76 to 0.97).[23] Therefore, rather than aiming for the maximal amount from the start, clinicians should target any physical activity or exercise that patients are willing to begin, supporting them to generate solutions to perceived barriers.[24] In the presence of disabilities that prevent exercise at a moderate or vigorous level, clinicians should recommend physical activity at a lower level that is comfortable and, over time, encourage longer duration and increased frequency.

For people with obesity, a pooled meta-analysis showed that an average of 46 minutes of walking 4 times weekly at a moderate intensity over 12 to 16 weeks led to overall weight loss of 2.13 kg (95% CI −3.2 to −1.06), a reduction of BMI by 0.96 kg/m^2 (95% CI −1.44 to −0.48) and a reduction in waist circumference of 2.83 cm (95% CI −4.13 to −1.53). A subgroup analysis on women older than 50 years who did not lose weight still found that physical activity was associated with an improvement in waist circumference resulting from an increase in fat-free mass.[25]

Table 1: C-CHANGE 2022 recommendations on health behaviours for all people

Source guideline	Recommendation	Grade or strength of recommendation and category or level of evidence*†
Dietary		
	Treatment targets and thresholds	
Dietary[8]	Nutritious foods are the foundation for healthy eating. Vegetables, fruit, whole grains and protein foods should be consumed regularly. Among protein foods, plant-based should be consumed more often. Protein foods include legumes, nuts, seeds, tofu, fortified soy beverage, fish, shellfish, eggs, poultry, lean red meat (including wild game), lower-fat milk, lower-fat yogourts, lower-fat kefir and cheeses lower in fat and sodium. Foods that contain mostly unsaturated fat should replace foods that contain mostly saturated fat. Water should be the beverage of choice. *(New recommendation)*	Evidence: strong
Dietary[8]	Processed or prepared foods and beverages that contribute to excess sodium, free sugars or saturated fat undermine healthy eating and should not be consumed regularly. *(New recommendation)*	Evidence: strong
Hypertension[9]	In healthy adults, abstaining from alcohol or reducing alcohol intake to 2 drinks per day or less is recommended to prevent hypertension. *(New recommendation)*	Recommendation: grade B
Hypertension[9]	To prevent hypertension and reduce blood pressure, adults with hypertension should consider reducing sodium intake toward 2000 mg (5 g of salt or 87 mmol of sodium) per day.	Recommendation: grade A
Physical activity and movement behaviours		
	Screening and diagnostic strategies	
Stroke[10]	People at risk of stroke and patients who have had a stroke should be assessed for vascular disease risk factors, lifestyle management issues (diet, sodium intake, exercise, weight, alcohol intake, smoking) and use of oral contraceptives or hormone replacement therapy.	Recommendation: grade B
	Treatment targets and thresholds	
CACPR[11]	The initiation of physical activity in previously inactive or highly sedentary populations should preferably take place within a comprehensive health behaviour change program. To achieve optimal health benefits, a progressive and individualized program with the target energy expenditure of moderate to vigorous physical activity for 30–60 min most days of the week is recommended. The use of practical tools to facilitate physical activity, such as pedometers, smart watches or phones, or time, distance, activity and caloric equivalence charts, may help to improve adherence. *(New recommendation)*	Recommendation: grade B
Obesity[12]	Aerobic physical activity (30–60 min of moderate to vigorous intensity most days of the week) can be considered for adults who want to (*new recommendation*):	
	• Achieve small amounts of body weight and fat loss	Recommendation: grade B; evidence: level 2a
	• Achieve reduction in abdominal visceral fat and ectopic fat, such as liver and heart fat, even in the absence of weight loss	Recommendation: grade A; evidence: level 1a
	• Favour weight maintenance after weight loss • Favour the maintenance of fat-free mass during weight loss • Increase cardiorespiratory fitness and mobility	Recommendation: grade B; evidence: level 2a
Smoking cessation		
	Screening and diagnostic strategies	
CANADAPTT[13]	Tobacco use status of all patients should be updated on a regular basis and health care providers should clearly advise patients to quit smoking. *(New recommendation)*	Recommendation: grade A; evidence: level 1
CANADAPTT[13]	Health care providers should clearly advise patients or clients to quit. *(New recommendation)*	Recommendation: grade C; evidence: level 1
	Pharmacologic and procedural therapy for risk reduction	
CANADAPTT[13]	Combining counselling and smoking cessation medication is more effective than either alone; therefore, both should be provided to patients or clients trying to stop smoking, where feasible. *(New recommendation)*	Recommendation: grade A; evidence: level 1

Note: CACPR = Canadian Association of Cardiovascular Prevention and Rehabilitation guideline, CANADAPTT = Canadian Action Network for the Advancement, Dissemination and Adoption of Practice-Informed Tobacco Treatment guideline, Dietary = Canada's Dietary Guidelines for Health Professionals and Policy-Makers (Health Canada), Hypertension = Hypertension Canada guideline, Obesity = Obesity Canada/Canadian Association of Bariatric Physicians & Surgeons guideline, Stroke = Canadian Stroke Best Practice Recommendations (Heart and Stroke Foundation).
*Unless otherwise indicated.
†See Appendix 2a (available at www.cmaj.ca/lookup/doi/10.1503/cmaj.220138/tab-related-content) for summary of grading for each included guideline and Appendix 2b for comparison of grading schemes.

Table 2 (part 1 of 6): C-CHANGE 2022 recommendations for people with obesity, diabetes or hypertension

Source guideline	Recommendation	Grade or strength of recommendation and category or level of evidence*†
Obesity		
	Screening and diagnostic strategies	
Obesity[12]	We suggest that a comprehensive history to identify root causes of weight gain as well as complications of obesity and potential barriers to treatment should be included in the assessment. *(New recommendation)*	Recommendation: grade D; evidence: level 4
	Pharmacologic and procedural therapy for risk reduction	
Obesity[12]	Pharmacotherapy for weight loss can be used for people with BMI ≥ 30 kg/m^2 or BMI ≥ 27 kg/m^2 with adiposity-related complications, in conjunction with medical nutrition therapy, physical activity and psychological interventions (liraglutide 3.0 mg, naltrexone-bupropion combination, orlistat). *(New recommendation)*	Recommendation: grade B; evidence: level 2a
Obesity[12]	Bariatric surgery can be considered for people with BMI ≥ 40 kg/m^2 or BMI ≥ 35 kg/m^2 with at least 1 adiposity-related disease to (*new recommendation*):	Recommendation: grade D (consensus); evidence: level 4
	• Reduce long-term overall mortality	Recommendation: grade B; evidence: level 2b
	• Induce significantly better long-term weight loss compared with medical management alone	Recommendation: grade A; evidence: level 1a
Diabetes		
	Screening and diagnostic strategies	
Diabetes[14]	Screening for diabetes using FPG or A_{1c} or both should be performed every 3 years in individuals aged ≥ 40 yr or at high risk, using a risk calculator. Earlier testing or more frequent follow-up (every 6 to 12 mo with either FPG or A_{1c} or 2hPG in a 75 g OGTT should be considered in those at very high risk, using a risk calculator, or in people with additional risk factors for diabetes. *(New recommendation)*‡	Recommendation: grade D; evidence: consensus
Diabetes[14]	Diabetes should be diagnosed by any of the following criteria (*updated recommendation*):	
	• FPG ≥ 7.0 mmol/L	Recommendation: grade B; evidence: level 2
	• A_{1c} ≥ 6.5% (for use in adults in the absence of factors that affect the accuracy of A_{1c} and not for use in those with suspected type 1 diabetes)	Recommendation: grade B; evidence: level 2
	• 2hPG in a 75 g OGTT ≥ 11.1 mmol/L	Recommendation: grade B; evidence: level 2
	• Random PG ≥ 11.1 mmol/L	Recommendation: grade D; evidence: consensus
	Treatment targets and thresholds	
Diabetes[14]	All individuals with diabetes should follow a comprehensive, multifaceted approach to reduce CV risk, including (*new recommendation*):	
	• A_{1c} ≤ 7.0% implemented early in the course of diabetes	Recommendation: grade C; evidence: level 3
	• Systolic BP of < 130 mm Hg and diastolic BP of < 80 mm Hg	Recommendation: grade C; evidence: level 3
	• Additional vascular-protective medication in most adults with diabetes	Recommendation: grade B; evidence: level 1
	• Achievement and maintenance of healthy weight goals	Recommendation: grade A; evidence: level 1
	• Healthy eating	Recommendation: grade D; evidence: consensus
	• Regular physical activity	Recommendation: grade D; evidence: consensus
	• Smoking cessation	Recommendation: grade C; evidence: level 3
Diabetes[14] and Hypertension[9]	People with diabetes mellitus should be treated to attain systolic BP of < 130 mm Hg and diastolic BP of < 80 mm Hg (these target BP levels are the same as BP treatment thresholds).	Systolic BP: recommendation: grade C; evidence: level 3 Diastolic BP: recommendation: grade B; evidence: level 1

Table 2 (part 2 of 6): C-CHANGE 2022 recommendations for people with obesity, diabetes or hypertension

Source guideline	Recommendation	Grade or strength of recommendation and category or level of evidence*†
Diabetes (continued)		
	Treatment targets and thresholds (continued)	
Diabetes[15]	In most people with type 1 or type 2 diabetes, an $A_{1c} \leq 7.0\%$ should be targeted to reduce the risk of (*new recommendation*):	
	• Microvascular (CV complications)	Recommendation: grade A; evidence: level 1A
	• and, if implemented early in the course of disease, CV complications	Recommendation: grade B; evidence: level 3
Diabetes[15]	In people with type 2 diabetes, an $A_{1c} \leq 6.5\%$ may be targeted to reduce the risk of:	
	• CKD	Recommendation grade A; evidence: level 1A
	• Retinopathy	Recommendation grade A; evidence: level 1A
	• if they are assessed to be at low risk of hypoglycemia based on class of antihyperglycemic medication(s) utilized and the person's characteristics *(new recommendation)*	Grade D, consensus
Diabetes[15]	In adults with type 2 diabetes with ASCVD, HF or CKD, treatment should include agents from the following classes with demonstrated CV or renal benefits (*new recommendation*):	
	• In adults with type 2 diabetes and ASCVD, a GLP1-RA or SGLT2i with CV or renal benefit should be used to reduce the risk of:	
	- MACE	Liraglutide and dulaglutide: recommendation: grade A; evidence: level 1A Subcutaneous semaglutide: recommendation: grade B; evidence: level 2 Empagliflozin: recommendation: grade A; evidence: level 1A Canagliflozin: recommendation: grade B; evidence: level 2
	- Hospital admission for heart failure	Empagliflozin, canagliflozin, dapagliflozin: recommendation: grade B; evidence: level 2
	- Progression of nephropathy	Empagliflozin, canagliflozin, dapagliflozin: recommendation: grade B; evidence: level 2
	• In adults with type 2 diabetes and a history of HF (reduced ejection fraction < 40%):	
	- An SGLT2i should be used to reduce the risk of HHF or CV death, if the eGFR is > 30 mL/min/1.73 m^2	Dapagliflozin: recommendation: grade A; evidence: level 1A Empagliflozin, canagliflozin: recommendation: grade A, level 1
	- Thiazolidinedione and saxagliptin should be avoided owing to their higher risk of HF	Recommendation: grade A; evidence: level 1A
	• In adults with type 2 diabetes and CKD and an eGFR > 30 mL/min/1.73 m^2:	
	- An SGLT2i should be used to reduce the risk of:	
	Progression of nephropathy	Canagliflozin: recommendation: grade A; evidence: level 1A Empagliflozin, dapagliflozin: recommendation: grade A; evidence: level 1
	Hospital admission for heart failure	Canagliflozin, dapagliflozin and empagliflozin: recommendation: grade A; evidence: level 1
	MACE	Canagliflozin: recommendation: grade B; evidence: level 2 Empagliflozin: grade C; evidence: level 3
	- A GLP1-RA may be considered to reduce the risk of MACE	Liraglutide, semaglutide: recommendation: grade B; evidence: level 2

Table 2 (part 3 of 6): C-CHANGE 2022 recommendations for people with obesity, diabetes or hypertension

Source guideline	Recommendation	Grade or strength of recommendation and category or level of evidence*†
Diabetes (continued)		
	Treatment targets and thresholds (continued)	
Diabetes[15]	ACEi or ARB, at doses that have demonstrated vascular protection, should be used to reduce CV risk in adults with type 1 or type 2 diabetes with any of the following:	
	• Clinical CVD	Recommendation: grade A; evidence: level 1
	• Age ≥ 55 yr with an additional CV risk factor or end organ damage (albuminuria, retinopathy, left ventricular hypertrophy)	Recommendation: grade A; evidence: level 1
	• Microvascular complications	Recommendation: grade D; evidence: consensus
Diabetes[15]	In adults with type 2 diabetes requiring treatment advancement or adjustment to improve glycemic control, the choice of antihyperglycemic medication should be individualized according to clinical priorities: • In adults with type 2 diabetes aged 60 yr or older with at least 2 CV risk factors§, inclusion of the following classes in glycemic management should be considered:	
	• A GLP1-RA with proven CV outcome benefit to reduce the risk of MACE; *or*	Dulaglutide: recommendation: grade A; evidence: level 1A Liraglutide: recommendation: grade B; evidence: level 2 Subcutaneous semaglutide: recommendation: grade C; evidence: level 2
	• An SGLT2i with proven cardiorenal outcome benefit if eGFR is > 30 mL/min/1.73 m^2 to reduce the risk of:	
	- Hospital admission for heart failure	Dapagliflozin and canagliflozin: recommendation: grade B; evidence: level 2
	- Progression of nephropathy	Canagliflozin, dapagliflozin: recommendation: grade C; evidence: level 3
	• If reducing risk of hypoglycemia is a priority: incretin agents (DPP4i or GLP1-RA), SGLT2i, acarbose or pioglitazone or both should be considered as add-on medication to improve glycemic control with a lower risk of hypoglycemia than other agents	Recommendation: grade A; evidence: level 1A
	• If weight loss is a priority: A GLP1-RA or SGLT2i should be considered as add-on medication to improve glycemic control with more weight loss than other agents *(new recommendation)*	Recommendation: grade A; evidence: level 1A
Diabetes[15]	In people not achieving glycemic targets on existing noninsulin antihyperglycemic medication(s), the addition of a basal insulin regimen should be considered over premixed insulin or bolus-only regimens, if lower risk of hypoglycemia or preventing weight gain or both are priorities. *(New recommendation)*	Recommendation: grade B; evidence: level 2
Diabetes[15]	In adults with type 2 diabetes treated with basal insulin therapy, if minimizing risk of hypoglycemia is a priority: • Long-acting insulin analogues (insulin glargine U-100, glargine U-300, detemir, degludec) should be considered over NPH insulin to reduce the risk of nocturnal and symptomatic hypoglycemia *(new recommendation)*	Recommendation: grade A; evidence: level 1A
Diabetes[15]	Pharmacotherapy may need to be temporarily adjusted during acute illness or around the time of some investigations (*new recommendation*): • Metformin and SGLT2i should be temporarily withheld during acute illnesses associated with risk for dehydration or procedures associated with high risk of acute kidney injury • Insulin and insulin secretagogue doses should be decreased or held to reduce risk for hypoglycemia if oral intake is reduced	Recommendation: grade D; evidence: consensus

Table 2 (part 4 of 6): C-CHANGE 2022 recommendations for people with obesity, diabetes or hypertension

Source guideline	Recommendation	Grade or strength of recommendation and category or level of evidence*†
Hypertension		
	Screening and diagnostic strategies	
Hypertension[9]	Routine laboratory tests that should be performed for the investigation of all patients with hypertension include the following:	
	• Urinalysis	Recommendation: grade D
	• Blood chemistry (potassium, sodium and creatinine)	Recommendation: grade D
	• Fasting blood glucose or glycated hemoglobin or both	Recommendation: grade D
	• Serum total cholesterol, LDL, HDL, non-HDL cholesterol and triglycerides; lipids may be drawn fasting or nonfasting	Recommendation: grade D
	• Standard 12-lead electrocardiography	Recommendation: grade C
Hypertension[9]	Patients with hypertension and evidence of heart failure should have an objective assessment of left ventricular ejection fraction, either by echocardiogram or nuclear imaging.	Recommendation: grade D
Hypertension[9]	Four approaches can be used to assess BP:	
	• AOBP is the preferred method of performing OBPM. The BP value calculated and displayed by the device should be used. When using AOBP, displayed mean SBP ≥ 135 mm Hg or DBP ≥ 85 mm Hg is high	Recommendation: grade D
	• When using OBPM, the first reading should be discarded, and the latter readings averaged. Mean SBP between 130 and 139 mm Hg or mean DBP between 85 and 89 mm Hg is high-normal, and mean SBP ≥ 140 mm Hg or DBP ≥ 90 mm Hg is high	Recommendation: grade C
	• Using ambulatory blood pressure monitoring, mean awake SBP ≥ 135 mm Hg or DBP ≥ 85 mm Hg or mean 24-h SBP ≥ 130 mm Hg or DBP ≥ 80 mm Hg are high	Recommendation: grade C
	• Using HBPM, mean SBP ≥ 135 mm Hg or DBP > 85 mm Hg are high and associated with an increased overall mortality risk (grade C). HBPM values should be on the basis of a series comprising the mean of duplicate measures, for morning and evening, for a 7-day period. First-day home BP values should not be considered.	Recommendation: grade D
Hypertension[9]	The use of HBPM on a regular basis should be considered for patients with hypertension, particularly those with:	
	• Inadequately controlled hypertension	Recommendation: grade B
	• Diabetes mellitus	Recommendation: grade D
	• Chronic kidney disease	Recommendation: grade C
	• Suspected nonadherence	Recommendation: grade D
	• Demonstrated white-coat effect	Recommendation: grade C
	• BP controlled in the office but not at home (masked hypertension)	Recommendation: grade C
Hypertension[9]	In patients with large arm circumference when standard upper arm measurement methods cannot be used, validated wrist devices (used with arm and wrist supported at heart level) may be used for blood pressure estimation.	Recommendation: grade D
	Treatment targets and thresholds	
Hypertension[9]	For high-risk patients aged 50 years or older, with SBP levels ≥ 130 mm Hg, intensive management to target a SBP of ≤ 120 mm Hg should be considered. Intensive management should be guided by AOBP measurements. Patient selection for intensive management is recommended and caution should be taken in certain high-risk groups.	Recommendation: grade B
Hypertension[9]	Antihypertensive therapy should be prescribed for average DBP measurements of ≥ 100 mm Hg or average SBP measurements of ≥ 160 mm Hg in patients without macrovascular target organ damage or other cardiovascular risk factors.	Diastolic BP: recommendation: grade A Systolic BP: recommendation: grade A

Table 2 (part 5 of 6): C-CHANGE 2022 recommendations for people with obesity, diabetes or hypertension

Source guideline	Recommendation	Grade or strength of recommendation and category or level of evidence*†
Hypertension (continued)		
	Treatment targets and thresholds (continued)	
Hypertension[9]	Antihypertensive therapy should be strongly considered for average DBP readings ≥ 90 mm Hg or for average SBP readings ≥ 140 mm Hg (targets established using OBPM) in the presence of macrovascular target organ damage or other independent cardiovascular risk factors.	Diastolic BP: recommendation: grade A Systolic BP: recommendation: grade B
	Pharmacologic or procedural therapy for risk reduction	
Hypertension[9]	Initial therapy should be with either monotherapy or single pill combination.	
	• Recommended monotherapy choices are:	
	◦ A thiazide or thiazide-like diuretic, with longer-acting diuretics preferred	Recommendation: grade A
	◦ A β-blocker (in patients younger than 60 yr)	Recommendation: grade B
	◦ An ACEi (in patients who are not Black)	Recommendation: grade B
	◦ An ARB; or	Recommendation: grade B
	◦ A long-acting CCB	Recommendation: grade A
	• Recommended single pill combination choices are those in which an ACEi is combined with a CCB, ARB with a CCB, or ACEi or ARB with a diuretic.	ARB with CCB: recommendation: grade B ACEi or ARB with diuretic: recommendation: grade B
	• Hypokalemia should be avoided in patients treated with thiazide or thiazide-like diuretic monotherapy.	Recommendation: grade C
	• Additional antihypertensive drugs should be used if target blood pressure levels are not achieved with standard dose monotherapy.	Recommendation: grade B
	• Add-on drugs should be chosen from first-line choices. Useful choices include a thiazide or thiazide-like diuretic or CCB with 1 of an ACEi, ARB or β-blocker.	Thiazide or thiazide-like diuretic and dihydropyridine CCB: recommendation: Grade B Dihydropyridine CCB and ACEi: recommendation: grade A All other combinations: recommendation: grade D
	• Caution should be exercised in combining a nondihydropyridine CCB and a β-blocker.	Recommendation: grade D
	• The combination of an ACEi and ARB is not recommended.	Recommendation: grade A
	• α-Blockers are not recommended as first-line agents for uncomplicated hypertension; β-blockers are not recommended as first-line therapy for uncomplicated hypertension in patients aged 60 years or older.	Recommendation: grade A
	• ACEi are not recommended as first-line therapy for uncomplicated hypertension in patients who are Black. However, these agents may be used in combination therapy, or in patients with certain comorbid conditions.	Recommendation: grade A
Hypertension[9] and Diabetes[14]	For people with cardiovascular or kidney disease, including microalbuminuria or with CV risk factors in addition to diabetes and hypertension, an ACEi or an ARB is recommended as initial therapy.	Recommendation: grade A

People with obesity, diabetes or hypertension

Recommendations for people with obesity, diabetes or hypertension are outlined in Table 2. Obesity is now recognized as a chronic disease. In the health care setting, weight bias among providers reduces quality of care and can be identified with self-assessment tools.[12] The development of personalized management plans is facilitated by understanding an individual's context and culture and integrating these with the root causes of their obesity.[12]

The pillars of obesity therapy include behavioural and psychological interventions, pharmacotherapy and bariatric surgery. Medical therapy to aid with weight loss is now effective and safe, and may include the glucagon-like peptide-1 (GLP1)-receptor antagonists. In a randomized controlled trial, adults with a BMI of at least 30 kg/m^2, or 27 kg/m^2 with comorbidities, and who were able to take liraglutide over the 3-year study period, lost weight and developed new diabetes more slowly (2.7 times longer [95% CI 1.9 to 3.9]) than those on placebo.[26] Bariatric surgery has been shown

Table 2 (part 6 of 6): C-CHANGE 2022 recommendations for people with obesity, diabetes or hypertension

Source guideline	Recommendation	Grade or strength of recommendation and category or level of evidence*†
Hypertension (continued)		
	Pharmacologic or procedural therapy for risk reduction (continued)	
Hypertension[9]	For initial therapy:	
	• An ARB is recommended if ACEi are not tolerated for the treatment of hypertension and heart failure.	Recommendation: grade A
	• For most patients with hypertension with coronary artery disease, an ACEi or ARB is recommended.	Recommendation: grade A
	• For patients with high-risk hypertension, when combination therapy is being used, choices should be individualized. The combination of an ACEi and a dihydropyridine CCB is preferable to an ACEi and a thiazide or thiazide-like diuretic.	Recommendation: grade A
	• For patients with stable angina pectoris but without previous HF, MI or coronary artery bypass surgery, either a β-blocker or a CCB can be used as initial therapy.	Recommendation: grade B
	• For patients with recent MI, initial therapy should include a β-blocker as well as an ACEi. An ARB can be used if the patient is intolerant of an ACEi.	Recommendation: grade A
	• Antihypertensive therapy is recommended for average SBP measurements of > 140 mm Hg or DBP measurements of > 90 mm Hg in pregnant patients with chronic hypertension, gestational hypertension or preeclampsia. Initial antihypertensive therapy should be monotherapy from the following first-line drugs: oral labetalol, oral methyldopa, long-acting oral nifedipine, or other oral β-blockers (acebutolol, metoprolol, pindolol and propranolol). *(New recommendation)*	Recommendation: grade C
	• Antihypertensive drugs used in breastfeeding patients include labetalol, methyldopa, long-acting nifedipine, enalapril or captopril. *(New recommendation)*	Recommendation: grade D

Note: 2hPG = 2-hour post-glucose, A_{1c} = glycosylated hemoglobin, ACEi = angiotensin-converting enzyme inhibitors. AOBP = automated office blood pressure measurement, ARB = angiotensin receptor blocker, ASCVD = atherosclerotic cardiovascular disease, BMI = body mass index, BP = blood pressure, CCB = calcium channel blocker, CKD = chronic kidney disease, CV = cardiovascular, Diabetes = Diabetes Canada guideline, DPP4i = dipeptidyl peptidase 4 inhibitor, eGFR = estimated glomerular filtration rate, FPG = fasting plasma glucose, GLP1-RA = glucagon-like peptide-1 receptor agonist, HBPM = home blood pressure measurement, HDL = high-density lipoprotein, HF = heart failure, HHF = hypertensive heart failure, Hypertension = Hypertension Canada guideline, LDL = low-density lipoprotein, MACE = major adverse cardiac event, MI = myocardial infarction, NPH = normal pressure hydrocephalus, Obesity = Obesity Canada/Canadian Association of Bariatric Physicians & Surgeons guideline, OBPM = office blood pressure measurement, OGTT = oral blood glucose tolerance test, PG = postglucose, SGLT2 = sodium–glucose cotransporter-2 inhibitor.
*Unless otherwise indicated.
†See Appendix 2a (available at www.cmaj.ca/lookup/doi/10.1503/cmaj.220138/tab-related-content) for summary of grading for each included guideline, and Appendix 2b for comparison of grading schemes.
‡See Appendix 3 (available at www.cmaj.ca/lookup/doi/10.1503/cmaj.220138/tab-related-content) for risk factors for diabetes.
§See Appendix 4 (available at www.cmaj.ca/lookup/doi/10.1503/cmaj.220138/tab-related-content) for cardiovascular risk factors.

to be effective for treating obesity. A network analysis showed that a Roux-en-Y gastric bypass improved BMI at 2 years, with a mean difference of –7.2 kg/m^2 (95% CI –8.9 to –5.5).[27] Weight loss leads to improvement in other adiposity-related risk factors.[28]

A major change in the management of diabetes since the 2018 C-CHANGE update is the new evidence showing cardiovascular risk reduction for GLP1 receptor agonist and sodium–glucose cotransporter 2 (SGLT2) inhibitor classes: for both classes in reducing major adverse cardiovascular events (MACE), and for SGLT2 inhibitor drugs in reducing heart failure resulting in hospital admission and progression of nephropathy. The previous recommendation for using these agents to treat people with diabetes and ASCVD was changed in this 2022 update to include primary prevention for those aged 60 years and older with 2 or more cardiovascular risk factors such as tobacco use, dyslipidemia or hypertension, in conjunction with the removal of the requirement for uncontrolled glycosylated hemoglobin (HbA_{1c}).

The Semaglutide in Subjects with Type 2 Diabetes (SUSTAIN-6) study enrolled patients with type 2 diabetes and an HbA_{1c} of 7% or greater with ASCVD if they were aged 50 years or older, and if 60 years or older, patients could have only 1 cardiovascular risk factor, such as abnormal albuminuria, hypertension and left ventricular hypertrophy or peripheral vascular disease.[29] After a median follow-up of 2.1 years, for the primary composite outcome of MACE, there was a 26% relative risk reduction with use of semaglutide (hazard ratio [HR] 0.74, 95% CI 0.58 to 0.95; number needed to treat [NNT] 44).

The Researching Cardiovascular Events with a Weekly Incretin in Diabetes (REWIND) trial enrolled participants with type 2 diabetes; 68.5% of participants had at least 2 cardiovascular risk factors and no previous cardiovascular events (primary prevention).[30] After a median follow-up of 5.4 years, there was a lower incidence of MACE with dulaglutide than with placebo, with a 12% relative risk reduction (HR 0.88, 95% CI 0.79 to 0.99; NNT 71).

Table 3 (part 1 of 2): C-CHANGE 2022 recommendations for people with dyslipidemia, atherosclerotic vascular disease or congestive heart failure

Source guideline	Recommendation	Grade or strength of recommendation and category or level of evidence*†
Dyslipidemia		
	Screening and diagnostic strategies	
CCS Dyslipidemia[16]	We recommend lipid or lipoprotein screening (in either fasting or nonfasting state) for men and women aged > 40 yr or at any age with 1 of the specific conditions listed.‡	Recommendation: strong; evidence: high-quality
CCS Dyslipidemia[16]	We recommend that a CV risk assessment be completed every 5 years for men and women aged 40 to 75 yr using the modified FRS or CLEM to guide therapy to reduce major CV events. A risk assessment might also be completed whenever a patient's expected risk status changes.	Recommendation: strong; evidence: high-quality
CCS Dyslipidemia[16]	We recommend that for any patient with triglycerides > 1.5 mmol/L, non-HDL-C or ApoB be used instead of LDL-C as the preferred lipid parameter for screening. *(New recommendation)*	Recommendation: strong; evidence: high-quality
	Treatment targets and thresholds	
CCS Dyslipidemia[16]	Threshold in primary prevention, for intensification of maximally tolerated statin dose. If LDL-C consistently > 2.0 mmol/L or ApoB > 0.8 g/L or non-HDL-C > 2.6 mmol/L, discuss add-on therapy with patient. Evaluate reduction in CVD risk vs. cost or access and adverse effects. Ezetimibe can be added as first-line and bile acid sequestrants as alternative. *(New recommendation)*	Recommendation: strong; evidence: moderate-quality
	Pharmacologic and procedural therapy for risk reduction	
CCS Dyslipidemia[16]	We recommend management that includes statin therapy for individuals at intermediate risk (modified FRS 10%–19%) with LDL-C ≥ 3.5 mmol/L to decrease the risk of CVD events. Statin therapy should also be considered for intermediate-risk people with LDL-C < 3.5 mmol/L but with ApoB ≥ 1.2 g/L or non-HDL-C ≥ 4.3 mmol/L or in men 50 years of age and older and women aged 60 yr and older with ≥ 1 CV risk factor. *(Updated recommendation)*	Recommendation: strong; evidence: high-quality
Atherosclerotic vascular disease		
	Screening and diagnostic strategies	
Hypertension[9]	Consider informing patients of their global ASCVD risk to improve the effectiveness of risk factor modification. Consider also using analogies that describe comparative risk such as "cardiovascular age," "vascular age" or "heart age" to inform patients of their risk status.	Recommendation: grade B
	Treatment targets and thresholds	
CACPR[11]	Patients living with CVD entering cardiovascular rehabilitation programs should be offered both aerobic and resistance exercises to reduce CV mortality, reduce hospital readmissions and improve quality of life. *(New recommendation)*	Recommendation: grade A
	Pharmacologic and procedural therapy for risk reduction	
Diabetes[14]	In people with established CVD, low-dose ASA therapy (81–162 mg) should be used to prevent CV events.	Recommendation: grade B; evidence: level 2
Diabetes[14]	We no longer recommend ASA for primary prevention of CVD in people with diabetes. *(New recommendation)*	Recommendation: grade A; evidence: level 1
CACPR[11]	Cardiac rehabilitation programs and services are recommended for most, and potentially all, patients with documented CVD. *(New recommendation)*	Recommendation: grade A
CCS Dyslipidemia[16]	We recommend use of high-intensity statin therapy in addition to appropriate health behaviour modifications for all secondary prevention patients with CVD. For patients who do not tolerate a high-intensity statin, we recommend the maximally tolerated statin dose.	Recommendation: strong; evidence: high-quality

Table 3 (part 2 of 2): C-CHANGE 2022 recommendations for people with dyslipidemia, atherosclerotic vascular disease or congestive heart failure

Source guideline	Recommendation	Grade or strength of recommendation and category or level of evidence*†
Congestive heart failure		
	Screening and diagnostic strategies	
CCS HF[17]	We recommend that BNP/NT-proBNP levels be measured to help confirm or rule out a diagnosis of HF in the acute or ambulatory care setting in patients in whom the cause of dyspnea is in doubt. *(New recommendation)*	Recommendation: strong; evidence: high-quality
	Pharmacologic and procedural therapy for risk reduction	
CCS HF[18]	We recommend that in the absence of contraindications, patients with HFrEF be treated with combination therapy including 1 evidence-based medication from each of the following categories (*new recommendation*): • ARNI (or ACEi/ARB) • β-blocker • MRA • SGLT2 inhibitor	Recommendation: strong; evidence: moderate-quality
CCS HF[17]	We recommend loop diuretics be used to control symptoms of congestion and peripheral edema.	Recommendation: strong; evidence: moderate-quality
CCS HF[17]	We recommend that an ARNI be used in place of an ACEi or ARB in patients with HFrEF who remain symptomatic despite treatment with appropriate doses of goal-directed medical therapy to decrease CV death, hospital admissions for HF, and symptoms.	Recommendation: strong; evidence: high-quality
CCS HF[17]	We recommend an ACEi or ARB in patients with ACEi intolerance, with acute MI with HF, or an LVEF < 40% post-MI, to be used as soon as safely possible post-MI.	Recommendation: strong; evidence: high-quality
CCS HF[17]	We recommend MRA treatment for patients with acute MI and LVEF ≤ 40%, and HF symptoms or diabetes, to reduce mortality, CV mortality and hospital admission for CV events.	Recommendation: strong; evidence: high-quality
CCS HF[17]	We recommend an SGLT2 inhibitor, such as dapagliflozin or empagliflozin, be used in patients with HFrEF, with or without concomitant type 2 diabetes, to improve symptoms and quality of life and to reduce the risk of hospital admission for HF or CV mortality or both. *(New recommendation)*	Recommendation: strong; evidence: high-quality

Note: ACEi = angiotensin-converting enzyme inhibitor, ApoB = apolipoprotein B, ARB = angiotensin receptor blocker, ARNI = angiotensin receptor-neprilysin inhibitor, ASA = acetylsalicylic acid, ASCVD = atherosclerotic cardiovascular disease, BNP/NT = proBNP-N-terminal (NT)-prohormone BNP, CACPR = Canadian Association of Cardiovascular Prevention and Rehabilitation guideline, CCS Dyslipidemia = Canadian Cardiovascular Society Guidelines for Dyslipidemia guideline, CCS HF = Canadian Cardiovascular Society Guidelines for the Management of Heart Failure, CLEM = Cardiovascular Life Expectancy Model, CV = cardiovascular, CVD = cardiovascular disease, Diabetes = Diabetes Canada guideline, FRS = Framingham Risk Score, HDL-C = high-density lipoprotein cholesterol, HF = heart failure, HFrEF = heart failure with reduced ejection fraction, Hypertension = Hypertension Canada guideline, LDL-C = low-density lipoprotein cholesterol, LVEF = left ventricular ejection fraction, MI = myocardial infarction, MRA = mineralocorticoid receptor antagonists, SGLT2 = sodium–glucose cotransporter.
*Unless otherwise indicated.
†See Appendix 2a (available at www.cmaj.ca/lookup/doi/10.1503/cmaj.220138/tab-related-content) for summary of grading for each included guideline and Appendix 2b for comparison of grading schemes.
‡See Appendix 5 (available at www.cmaj.ca/lookup/doi/10.1503/cmaj.220138/tab-related-content) for who to screen for dyslipidemia in adults at risk.

Most of those (59%) enrolled in the Dapagliflozin and Cardiovascular Outcomes in Type 2 Diabetes (DECLARE-TIMI 58) trial had cardiovascular risk factors only. After a median follow-up of 4.2 years in this predominantly primary prevention cohort, the incidence of MACE was not significantly improved, but there was a reduction in hospital admissions for heart failure of 27% (HR 0.73; 95% CI 0.61 to 0.88; NNT 43), and a reduction in progressive kidney disease of 24% (HR 0.76 95% CI 0.67 to 0.87; NNT 71).[31]

In patients with diabetes and advanced nephropathy, the Canagliflozin and Renal End Points in Diabetes with Established Nephropathy Clinical Evaluation (CREDENCE) study found a 30% relative risk reduction in the main renal composite outcome (renal or cardiovascular death, dialysis or doubling of creatinine) with canagliflozin (HR 0.70, 95% CI 0.58 to 0.82; NNT 22), as well as significant improvements in MACE, including hospital admissions for heart failure.[32] Cardiovascular and renal data showing similar protection in people with diabetes with empagliflozin confirm the class effect.[33,34]

Follow-up of patients who receive a diagnosis of hypertension and who are actively working on changing their health behaviours is recommended every 3 to 6 months. When antihypertensives are being adjusted to bring the blood pressure to target, patients should be followed up within 8 weeks, with shorter intervals if the patient is at higher cardiovascular risk.[9] People with 1 adiposity-related comorbidity, such as diabetes and hypertension, should be screened for other related risk factors.[35]

Table 4 (part 1 of 2): C-CHANGE 2022 recommendations for people with atrial fibrillation, stroke or dementia

Source guideline	Recommendation	Grade or strength of recommendation and category or level of evidence*†
Atrial fibrillation		
	Screening and diagnostic strategies	
CCS/CHRS AF[19]	We recommend that the initial evaluation of a patient with newly diagnosed AF include a complete history and physical examination, a 12-lead ECG, a transthoracic echocardiogram, and basic laboratory investigations (complete blood count, coagulation profile, serum electrolytes including calcium and magnesium, renal function, liver function, thyroid function, fasting lipid profile, fasting glucose and HbA_{1c})‡. *(New recommendation)*	Evidence: low-quality
	Treatment targets and thresholds	
CCS/CHRS AF[19]	When rate control of persistent AF is pursued, we recommend titrating rate-controlling agents to achieve a resting heart rate of < 100 beats/min during AF. *(New recommendation)*	Evidence: moderate-quality
	Pharmacologic and procedural therapy for risk reduction	
CCS/CHRS AF[19]	We recommend that the "CCS Algorithm"§ (CHAD-65) be used to guide the choice of antithrombotic therapy for the purpose of stroke or systemic embolism prevention in patients with NVAF. *(New recommendation)*	Evidence: high-quality
CCS/CHRS AF[19]	We recommend that OAC be prescribed for most patients with AF and age 65 yr or older or $CHADS_2$ score ≥ 1. *(New recommendation)*	Evidence: moderate-quality
CCS/CHRS AF[19]	We recommend that most patients should receive a DOAC (apixaban, dabigatran, edoxaban or rivaroxaban) in preference to warfarin when OAC therapy is indicated for patients with NVAF. *(New recommendation)*	Evidence: high-quality
CCS/CHRS AF[19]	We recommend that warfarin be used for patients with a mechanical prosthetic valve and those with AF and moderate to severe mitral stenosis. *(New recommendation)*	Evidence: moderate-quality
CCS/CHRS AF[19]	We recommend that patients with AF who are receiving OAC should have their renal function assessed at baseline and at least annually to detect latent kidney disease, determine OAC eligibility and to support drug dosing. *(New recommendation)*	Evidence: moderate-quality
CCS/CHRS AF[19]	We recommend that antithrombotic therapy in patients with AF and CKD be provided according to their risk of stroke or systemic embolism and the severity of renal dysfunction with selection of agent according to Appendix 7 (*new recommendation*):¶ • Stage 3 CKD or better (eGFR > 30 mL/min): we recommend that such patients receive antithrombotic therapy as determined by the "CCS algorithm" • Stage 4 CKD (eGFR 15–30 mL/min): we suggest that such patients receive antithrombotic therapy as determined by the "CCS algorithm" • Stage 5 CKD (eGFR < 15 mL/min or dialysis dependent): we suggest that such patients not routinely receive antithrombotic therapy for stroke prevention in AF	Evidence: high-quality
CCS/CHRS AF[19]	We recommend OAC alone for patients with AF aged 65 yr or older or with a $CHADS_2$ score ≥ 1 and stable coronary or arterial vascular disease. *(New recommendation)*	Evidence: moderate-quality
CCS/CHRS AF[19]	We recommend that OAC be prescribed for most frail elderly patients with AF. *(New recommendation)*	Evidence: moderate-quality
CCS/CHRS AF[19]	In patients with a gastrointestinal or genitourinary bleed after OAC initiation: We recommend that anticoagulant therapy be recommenced in patients at high risk of stroke as soon as possible after the cause of bleeding has been identified and corrected. *(New recommendation)*	Evidence: moderate-quality
CCS/CHRS AF[19]	We recommend that either β-blockers or ND-CCBs (diltiazem or verapamil) be first-line agents for AF rate control in patients without significant left ventricular dysfunction (e.g., patients with an LVEF > 40%). *(New recommendation)*	Evidence: moderate-quality
CCS/CHRS AF[19]	We recommend evidence-based β-blockers (bisoprolol, carvedilol, metoprolol) be first-line agents for rate control of hemodynamically stable AF in the acute care setting in patients with significant left ventricular dysfunction (LVEF ≤ 40%)	Evidence: moderate-quality

Table 4 (part 2 of 2): C-CHANGE 2022 recommendations for people with atrial fibrillation, stroke or dementia

Source guideline	Recommendation	Grade or strength of recommendation and category or level of evidence*†
Stroke		
	Screening and diagnostic strategies	
Stroke[10]	BP should be assessed and managed in all people with stroke or transient ischemic attack.	Evidence: level A
Stroke[10]	For patients being investigated for an embolic ischemic stroke or transient ischemic episode of undetermined source whose initial short-term ECG monitoring does not reveal AF but a cardioembolic mechanism is suspected, prolonged ECG monitoring for at least 2 wk is recommended to improve detection of paroxysmal AF in selected patients aged ≥ 55 yr who are not already receiving anticoagulant therapy but would be potential anticoagulant candidates. *(New recommendation)*	Evidence: level A
	Treatment targets and thresholds	
Hypertension[9]/stroke[10]	For patients who have had an ischemic stroke or transient ischemic attack, BP-lowering treatment is recommended to achieve a target of consistently lower than 140/90 mm Hg.	Evidence: level B
	Pharmacologic and procedural therapy for risk reduction	
Stroke[10]	Individuals presenting within 48 h of symptoms consistent with a new acute stroke or transient ischemic attack event (especially transient focal motor or speech symptoms, or persistent stroke symptoms) are at the highest risk for recurrent stroke and should be immediately sent to an emergency department with capacity for stroke care (including on-site brain imaging and, ideally, access to acute stroke treatments). *(New recommendation)*	Evidence: level B
Stroke[10]	For patients with ischemic stroke or transient ischemic attack, antiplatelet therapy is recommended for long-term secondary stroke prevention to reduce the risk of recurrent stroke and other vascular events unless there is an indication for anticoagulant therapy. *(New recommendation)*	Evidence: level A
Stroke[10]	For long-term secondary stroke prevention, either ASA (80–325 mg daily), or clopidogrel (75 mg/d), or combined ASA and extended-release dipyridamole (25 mg/200 mg twice per day) are all appropriate treatment options, and selection depends on patient factors or clinical circumstances.	Evidence: level A
Stroke[10]	For patients with an ischemic stroke or transient ischemic attack and atrial fibrillation, oral anticoagulant therapy is strongly recommended. It is recommended over ASA and dual antiplatelet therapy.	ASA: evidence: level A Dual antiplatelet therapy: evidence: level B
Dementia		
	Screening and diagnostic strategies	
Dementia[20]	An objective assessment of the patient's cognitive function could be achieved by using rapid psychometric screening tools such as the memory impairment screen and clock drawing test, the Mini-Cog, the AD8, the 4-item version of the MoCA (clock drawing, tap at letter A, orientation and delayed recall) and the GP Assessment of Cognition. *(New recommendation)*	Evidence: level 2B

Note: AF = atrial fibrillation, ASA = acetylsalicylic acid, CCB = calcium channel blocker, CCS/CHRS AF = Canadian Cardiovascular Society/Canadian Heart Rhythm Society Guidelines for the Management of Atrial Fibrillation, CHADS = congestive heart failure; hypertension; age ≥ 75 years; diabetes mellitus; and a previous history of stroke or transient ischemic attack, CKD = chronic kidney disease, Dementia = Canadian Consensus Conference on Diagnosis and Treatment of Dementia guideline, DOAC = direct oral anticoagulants, ECG = electrocardiogram, HbA_{1c} = glycated hemoglobin, Hypertension = Hypertension Canada guideline, LVEF = left ventricular ejection fraction, ND-CCB = non-dihydropyridine calcium channel blocker, NVAF = nonvalvular atrial fibrillation, OAC = oral anticoagulant, Stroke = Canadian Stroke Best Practice Recommendations, Heart and Stroke Foundation.
*Unless otherwise indicated.
†See Appendix 2a (available at www.cmaj.ca/lookup/doi/10.1503/cmaj.220138/tab-related-content) for summary of grading for each included guideline, and Appendix 2b for comparison of grading schemes.
‡See Appendix 6 (available at www.cmaj.ca/lookup/doi/10.1503/cmaj.220138/tab-related-content) for evaluation of patients with AF.
§Algorithm available at https://ccs.ca/app/uploads/2022/05/CCS_Top_10_Info_v5.pdf.
¶See Appendix 7 (available at www.cmaj.ca/lookup/doi/10.1503/cmaj.220138/tab-related-content) for recommendations on dosage of oral anticoagulants.

People with dyslipidemia, atherosclerotic vascular disease or congestive heart failure

Recommendations for people with dyslipidemia, ASCVD and congestive heart failure are summarized in Table 3. Acute myocardial infarction (MI) is associated with individual risk factors; data collected from virtually every country in the world show that risk of MI triples with current smoking or diabetes, and the risk doubles with hypertension, obesity, depression or dyslipidemia.[36]

Prevention of new ASCVD with statins is effective in people at intermediate risk (men aged 55 yr or older and women 65 yr or older, with at least 1 of elevated waist–hip ratio; low high-density lipoprotein; history of smoking; dysglycemia; family history of premature coronary disease; abnormal albuminuria; or estimated glomerular filtration rate < 50 mL/min). In the Heart Outcomes Prevention Evaluation–3 (HOPE–3) study, cholesterol-lowering with rosuvastatin 10 mg/d reduced the composite of cardiovascular death, nonfatal MI or stroke by 24% (HR 0.76, 95% CI 0.64 to 0.88; NNT 91), compared with placebo.[37]

The role of acetylsalicylic acid (ASA) for primary prevention continues to be downgraded, with the removal of the recommendation for its use in primary prevention for patients with hypertension aged 50 years and older.[9] The Diabetes Canada recommendations added a "should not" recommendation for the use of ASA for primary prevention of ASCVD in people with diabetes.[14] The recommendation for use of ASA for secondary prevention remains and is supported by strong evidence.[38]

The management of dyslipidemia now emphasizes a foundation of health behaviour change, with the addition of statins to lower low-density lipoprotein-C (LDL-C) below the risk-appropriate thresholds.[16] For most patients in whom statins are indicated for primary prevention of ASCVD events, the threshold is an LDL-C level less than 2.0 mmol/L. For the use of statins in secondary prevention (i.e., patients with established ASCVD), the threshold is now an LDL-C level of 1.8 mmol/L. If the LDL-C is not lowered below either 2.0 or 1.8 mmol/L on maximally tolerated statin, for primary and secondary prevention, respectively, this is an indication for intensification of therapy beyond statins, including the addition of ezetimibe or PCSK9 inhibitors or both. The Further Cardiovascular Outcomes Research with PCSK9 Inhibition in Subjects with Elevated Risk (FOURIER) study tested the PCSK9 inhibitor evolocumab compared with placebo in patients with LDL 1.8 mmol/L or higher with ASCVD on statin (5% were also taking ezetimibe).[39] At 48 weeks, there was a 15% reduction in risk of cardiovascular death, MI, stroke, hospital admission for unstable angina, or coronary revascularization (HR 0.85, 95% CI 0.79 to 0.92; NNT 67).[39]

The management of heart failure has substantially changed. A decision-analytic model showed that the all-cause mortality for patients with heart failure and reduced ejection fraction was 35% at 24 months without evidence-based therapy, dropping to 10% with the cumulative benefit of quadruple therapy.[40] Quadruple therapy comprises angiotensin receptor antagonist neprilysin inhibitors, β-blockers, mineralocorticoid receptor antagonists and SGLT2 inhibitors. The challenge now is to initiate and titrate these therapies expeditiously using goal-directed medical therapy. Most current treatment recommendations are relevant to patients with established heart failure with reduced ejection fraction. However, nearly half of all patients with heart failure have preserved or mildly reduced ejection fraction, and future guidance based on new evidence will likely reflect updated evidence for managing this subgroup of patients.

People with atrial fibrillation, stroke or dementia

The recommendations for people with atrial fibrillation, stroke or dementia are outlined in Table 4. Atrial fibrillation is a major risk for stroke and is estimated to be prevalent in 1.4% of people older than 65 years.[19] However, a prospective cohort study of 2171 patients aged 65 or older in Canadian primary care practices found that 2.7% had atrial fibrillation.[17] Stroke caused by atrial fibrillation is disabling in 60% of people and fatal in 20%.[18] Oral anticoagulation with warfarin reduces stroke from nonvalvular atrial fibrillation by 60% compared with placebo and 20% for antiplatelet therapy alone.[19] The new direct-acting oral anticoagulants have shown better efficacy, with equal or better safety, than warfarin and are now recommended over warfarin for patients with nonvalvular atrial fibrillation. A meta-analysis of the 4 direct-acting oral anticoagulants available in Canada (apixaban, dabigatran, edoxaban and rivaroxaban) showed a reduction of a composite of stroke and systemic embolism (RR 0.81, 95% CI 0.73 to 0.91), as well as less major bleeding (RR 0.85, 95% CI 0.73 to 1.00), than warfarin.[41]

For patients who survive a stroke, clinicians must also recognize that 20%–50% of affected people will also experience poststroke depression and anxiety, vascular cognitive impairment and poststroke fatigue.[20] Dementia usually has a vascular contribution from stroke and hypertension.[41] Screening for dementia is indicated if there is a clinical concern for a cognitive disorder or a history of stroke or transient ischemic attack, and should include an objective assessment of cognition and functional impairment.[20] A 4-item subset of the Montreal Cognitive Assessment, including clock drawing, tap-at-letter-A, orientation and delayed recall, was assessed in 8773 participants aged 65 years or older and was able to distinguish dementia from nondementia using an optimal cut-off score of < 10, with 87.9% sensitivity and 87.6% specificity.[42]

Depression and cardiovascular health

Comorbidity screening for people with or at risk for ASCVD should include depression, as mood disorders may be present in about a quarter of older adults.[42] Depression also has a direct impact on cardiovascular outcomes and management.[43]

In the absence of Canadian recommendations addressing depression and cardiovascular disease, and the request from the C-CHANGE patient panel to address depression, this subsection of the guideline has been added to reinforce the importance of depression as both a risk factor for the development of ASCVD and for worse outcomes, including mortality in patients with established ASCVD. We drew on the Scientific Statements from the American Heart Association and the European Society of Cardiology Working Group on Coronary Pathophysiology and Microcirculation.[43–46] The recommendations for screening, referral and treatment of depression in people with ASCVD in the American Heart Association statements were endorsed by the American Psychiatric Association.[43]

About 1 in 6 with ASCVD have a major depressive disorder and a greater proportion have depressive symptoms.[43,44,46] The interaction of depression with ASCVD is bidirectional, related to biological and psychological factors.[44] Raising awareness of the adverse effects of depression on ASCVD outcomes may improve patients' adherence to positive health behaviours, including medication use.[44,46]

Treatment for moderate to severe depression includes selective serotonin reuptake inhibitor antidepressants, such as sertraline or escitalopram (with occasional prolonged QTc effects);[44,46] psychological treatments, such as stress management and cognitive behavioural therapy;[44,46] and exercise and participation in cardiac rehabilitation programs.[44,46] Mindful meditation is a useful adjunct in dealing with mood and ASCVD risk factors.[44,46] A screening approach for all at-risk individuals and patients with ASCVD using the Patient Health Questionnaire-2 can be considered and, if positive, clinicians should be prepared to manage or appropriately refer those found to be depressed.[43,44,46]

Methods

The C-CHANGE guideline update is developed by a volunteer guideline panel with expertise in guideline development, dissemination, implementation and evaluation. Quality assurance in guideline development is supported by the Appraisal of Guidelines, Research and Evaluation instrument (AGREE II).[47,48]

Recommendations included in C-CHANGE guidelines are drawn from guideline recommendations recently published by partner guideline groups and selected by the C-CHANGE Guideline Panel using a modified Delphi process.[49] We added 3 guideline groups for this cycle (for a total of 11 guideline partners), as their recent guidelines were appropriate for C-CHANGE and each scored highly on the AGREE II checklist:[48] the Canadian Cardiovascular Society/Canadian Heart Rhythm Society guideline for the management of atrial fibrillation, Health Canada's Dietary Guideline and the Canadian Consensus Conference on Diagnosis and Treatment of Dementia guideline.[8,19,20]

Composition of participating groups

Three main groups were involved in the development of this update: the C-CHANGE Executive (R.J., S.T, J.S., P.L., D.H.-S.), the C-CHANGE Guideline Panel and the Community Consultation and Review Panel (Appendix 1). The guideline panel included the leads or committee chairs from each of the 11 partner guideline groups; a multidisciplinary and interprofessional group of experts in their respective specialties; and sufficient primary care practitioners to make up a majority of the panel. Members of the Scientific Planning and Review Committee for the Canadian Cardiovascular Health Education Program (CHEP+) were also invited to participate on the guideline panel (Appendix 1).

The executive was tasked with finding primary care physicians to participate on the guideline panel and with vetting potential guideline panellists. The development and role of the Community Consultation and Review Panel are discussed in the Patient Engagement subsection.

Guideline development

Updates for C-CHANGE guidelines are initiated when the C-CHANGE Executive meets with existing and new partner guideline groups and leads from these groups identify that there is sufficient new material to warrant an update. All relevant guidelines from the participating guideline groups considered for inclusion in the C-CHANGE process undergo an AGREE II assessment (D.H.-S.) to ensure academic rigour and appropriateness.

The development process for this update is summarized in Appendix 8 (available at www.cmaj.ca/lookup/doi/10.1503/cmaj.220138/tab-related-content). For this update, the executive reviewed recommendations from the 2018 C-CHANGE guideline[4] in conjunction with the leads from each partner group, for potential updates to individual recommendations and to identify recommendations targeted for removal. Furthermore, the executive reviewed all new guidelines from the groups, focusing on potential new recommendations that were directed toward primary care practice.

C-CHANGE uses a modified Delphi ranking process to select the final recommendations.[49] The executive instructed guideline panel members that their role in the ranking process was vital to ensure recommendations chosen are relevant, implementable and of high impact in primary care. To ensure that all guideline panel members understood their role, role summaries were provided, along with online group presentations with question-and-answer periods (repeated as needed), so that all panellists became familiar with the information. All guideline panel members had the same role and a single vote.

The executive asked guideline panel members to consider the impact of attempting to be comprehensive by adding many recommendations from each guideline group; instead, they were instructed to choose only those recommendations that would have the highest impact in primary care for patients with multimorbidity, thereby leading to a smaller, more pragmatic subset of recommendations. It is a concern that for patients with multimorbidity, following the Chronic Care Model may increase the patient's treatment burden (i.e., the impact of health care on patient well-being) through the addition of more treatments, testing and health care visits.[50] Increased treatment burden has been associated with nonadherence, particularly in patients with more adverse social determinants of health.[50] An insight from the concept of treatment burden in patients with multimorbidity and adverse social determinants of health is that nonadherence to prescribed therapy may be, in part, beyond the patient's control.

The executive instructed panellists that C-CHANGE prefers the strength of included recommendations to be strong, usually with wording "we recommend," indicating for clinicians that most patients should receive the recommendation, and that for patients, most people in that situation would want the recommended course of action.[50] To limit bias, we excluded recommendations based upon low-quality evidence unless they had a strong clinical impact, as suggested by partnering guideline leads — such as the use of loop diuretics in heart failure.

For this update, C-CHANGE used a pool of more than 200 recommendations for the first round of the ranking process. Because of the pandemic, meetings of the guideline panel took place by videoconference, with multiple meetings from June 2021 to September 2021, to ensure that everyone was able to participate. Voting templates on Excel spreadsheets were emailed to panel members for the voting rounds.

The voting process we used was adapted from the Hypertension Canada guideline process.[51] Existing recommendations (or their updated versions) from the 2018 guideline required support from 70% of those voting to remain. New recommendations

required a ranked score of at least 7 out of 10, to get to the second round of voting. In the second round, recommendations from 2018 with 70% voting to remain, and new recommendations with a minimum score of 7, were voted on to stay or to go, with a minimum of 80% of votes to keep a recommendation in this round. This led to the final set of recommendations, which we shared with the guideline panel members for final comments.

In the C-CHANGE guideline, we have preserved the original wording and grade of each recommendation from the original partner guideline. The strength of the quality of evidence supporting the recommendation is also described. An overview of the grading schemes is available in Appendix 2b. Readers are referred to each specific guideline group website for additional details on the grading scheme and for the literature review supporting each recommendation (Appendix 2a).

We did not perform economic evaluations, given the absence of robust, high-quality health economic evidence. C-CHANGE emphasizes the importance of guideline users making management decisions appropriate to the clinical circumstances and resource realities within their own jurisdiction or region.

We passed on feedback on recommendations assessed during the modified Delphi process, but not included in this guideline, to partnering guideline groups for their individual quality improvement processes.

Patient engagement

To reflect the patient voice, from ASCVD prevention to disease management, patient engagement for C-CHANGE took place in 3 phases. Before the C-CHANGE process, each guideline group had its own patient engagement process (more details available on each guideline group's website; see Appendix 2a). A member of the C-CHANGE executive (D.H.-S.) evaluated these processes as part of the AGREE II evaluation for each guideline group; the evaluation of the guidelines' patient-engagement processes can be found on the C-CHANGE website (www.cchangeguidelines.com).

After the modified Delphi process described above, C-CHANGE, working with the Canadian Stroke Best Practices Group, brought together 10 people in a Community Consultation and Review Panel (CCRP) to ensure that the patient and caregiver voice was included and the principles of equity, diversity and inclusion[52] endorsed and respected. The lived experience of the CCRP members (including persons with specific cardiovascular conditions and expert caregivers, defined as a person with sufficient lived experience and knowledge of the condition to meaningfully contribute to the CCRP; i.e., not a community health personal health worker who is not assigned permanently to that person) provided feedback and insights based on personal experiences. The inclusive nature of this group helped to ensure that the process and recommendations were grounded in real life experiences that directly reflected patients' needs and preferences. We requested specific feedback from the CCRP with respect to how they viewed the C-CHANGE process and its potential impact on their own primary health care provider. The patient engagement interview guide and some representative quotes are found in Appendix 9 (available at www.cmaj.ca/lookup/doi/10.1503/cmaj.220138/tab-related-content).

During the implementation process after the 2018 C-CHANGE guideline,[4] we sought patient voices through focus groups, and key informant interviews conducted with the Ontario College of Art and Design University (OCADU) Health Design unit. This process was reinitiated in partnership with OCADU for this 2022 guideline.

Management of competing interests

C-CHANGE follows the principles of the Guidelines International Network for guidance regarding the disclosure and management of competing interests throughout the guideline process (Appendix 10, available at www.cmaj.ca/lookup/doi/10.1503/cmaj.220138/tab-related-content).[53,54] Guideline panel members with competing interests represented only a minority of the panel (9 of 40 panel members). Those with competing interests were instructed to recuse themselves from voting on recommendations that could be influenced by these competing interests. Using the voting templates, recommendations for therapies associated with potential competing interests in panel members were cross-tabulated to ensure that recommendations continued to meet the designated voting approval thresholds. Before the voting process, we collected a completed International Committee of Medical Journal Editors disclosure of interest form from each panel member (these forms are available on the C-CHANGE website at https://www.cchangeguidelines.com/).[55]

Partner guideline groups addressed potential competing interests individually in developing their source guidelines, but all scored well on the C-CHANGE AGREE II assessment. Additional information is available from each group's website (Appendix 2a).

Implementation

C-CHANGE is involved in both dissemination and implementation strategies of its guidelines through its knowledge translation arm, CHEP+. Activities include an annual national conference with plenary speakers representing chairs of partnering guideline groups, as well as interactive case-based workshops accredited by the College of Family Physicians of Canada and the Royal College of Physicians and Surgeons of Canada, designed to help practitioners change their practice behaviours. At the provincial level, C-CHANGE will approach ministries of health to promote regional programs and propose workshops at national and provincial primary care meetings. C-CHANGE's publications and updates are posted on its website (https://www.cchangeguidelines.com/) and CHEP+ events and resources are posted on its website (https://www.chepplus.com/).

C-CHANGE supports partner guideline groups in guideline development and dissemination based on specific feedback on the implementability of individual recommendations, knowledge translation tools for clinicians such as outpatient flowsheets, and patient-oriented tools.

Ongoing "real-world" surveillance of practice changes recommended by the C-CHANGE guideline is important to identify where "practice gaps" exist and where guideline implementation efforts are most needed. Use of the set of quality indicators developed by the Cardiovascular Health in Ambulatory Care

Research Team (CANHEART) initiative (based on previous versions of the C-CHANGE guideline) has shown that health regions in Ontario with better adherence to these guidelines have better cardiovascular disease outcomes.[56]

We project that the next update of the C-CHANGE guideline will be in 2025, depending on sufficient changes in the existing recommendations, or sooner if warranted by new evidence that will substantially change primary care practice. During this time, C-CHANGE will continue to provide feedback to the individual guideline groups on their recommendations and implementation strategies.

Other guidelines

Internationally, guideline groups that regularly update their recommendations seem to be coming closer together than farther apart. Blood pressure targets for high-risk patients (e.g., older [> 75 yr], with chronic kidney disease, at high cardiovascular risk) continue to fall based on the Systolic Blood Pressure Intervention Trial (SPRINT).[57] The latest example is the Kidney Disease: Improving Global Outcomes (KDIGO) 2021 clinical practice guideline for the management of blood pressure in people with chronic kidney disease, with a systolic blood pressure target lower than 120 mm Hg for patients with or without diabetes.[58] This contrasts with C-CHANGE, in which the target systolic blood pressure for patients with diabetes (with or without chronic kidney disease) is still lower than 130/80 mm Hg and, for people with chronic kidney disease alone, lower than 120 mm Hg systolic. The KDIGO guideline developers decided to target a lower blood pressure for people with chronic kidney disease with or without diabetes to improve implementability, at the cost of weakening the evidentiary strength of recommendation. Table 5 highlights recommendations from other countries' guidelines that differ from those included in this C-CHANGE update.

Table 5: National and international guidelines for the management of cardiovascular disease

Organization (year)	Recommendation
European Association of Preventive Cardiology and the European Society of Cardiology (ESC) Council on Hypertension (2022)[59]	Patients with hypertension are advised to engage in at least 30 min of moderate-intensity aerobic exercise such as walking, jogging, cycling, or swimming on 5–7 d/wk for at least 150 min/wk. In addition, dynamic resistance exercises but not isometric exercises are recommended 2–3 d/wk.
National Institute for Health and Care Excellence (2019)[60]	Diagnosing Hypertension: It is recommended that diagnosis is based on out-of-office measurement, given the risk of white-coat hypertension, defined as a difference of > 20/10 mm Hg between clinic readings and average daytime home or ambulatory measurements. The gold standard is ambulatory blood pressure monitoring but, as this is not suitable or tolerated by everyone, home blood pressure monitoring is offered as an alternative. For home blood pressure monitoring, patients should be advised to take at least 2 recordings, 1 min apart, twice a day for 4 to 7 d. The first day of readings should be discounted and the mean of the remaining readings used.
KDIGO (2021)[61]	We suggest that adults with high BP and chronic kidney disease be treated with a target systolic BP of < 120 mm Hg, when tolerated, using standardized office BP measurement.
American Diabetes Association (2021)[62]	Among patients with type 2 diabetes who have established atherosclerotic cardiovascular disease or established kidney disease, a SGLT2 inhibitor or glucagon-like peptide 1 receptor agonist with demonstrated cardiovascular disease benefit is recommended as part of the comprehensive cardiovascular risk reduction or glucose-lowering regimens.
	ASA therapy (75–162 mg/d) may be considered as a primary prevention strategy in those with diabetes who are at increased cardiovascular risk, after a comprehensive discussion with the patient on the benefits versus the comparable increased risk of bleeding.
ESC, with the European Association for Cardio-Thoracic Surgery and the ESC European Heart Rhythm Association (2020)[63]	For stroke risk assessment, a risk factor–based approach is recommended, using the CHA_2DS_2-VASc clinical stroke risk score to initially identify patients at "low stroke risk" (CHA_2DS_2-VASc score = 0 in men, or 1 in women) who should not be offered antithrombotic therapy.
ESC, with the ESC Heart Failure Association (2021)[64]	SGLT2 inhibitors (canagliflozin, dapagliflozin, empagliflozin, ertugliflozin, sotagliflozin) are recommended in patients with type 2 diabetes mellitus at risk of cardiovascular events to reduce hospital admissions for heart failure, major cardiovascular events, end-stage renal dysfunction and cardiovascular death.
World Health Organization (2020)[65]	It is recommended that all adults undertake regular physical activity. Adults should do at least 150–300 min of moderate-intensity aerobic physical activity, or at least 75–150 min of vigorous-intensity aerobic physical activity, or an equivalent combination of moderate-intensity and vigorous-intensity activity throughout the week for substantial health benefits. Adults should also do muscle-strengthening activities at moderate or greater intensity that involve all major muscle groups on 2 or more days a week, as these provide additional health benefits.

Note: ASA = acetylsalicylic acid, BP = blood pressure, CHA_2DS_2-VASc = congestive heart failure or left ventricular dysfunction; hypertension; age ≥ 75 yr (doubled); diabetes; stroke or TIA (doubled) — vascular disease, age 65–74 yr, sex category (female), ESC = European Society of Cardiology, SGLT2 = sodium–glucose cotransporter 2.

Gaps in knowledge

Managing patients with multimorbidity is increasingly complex and requires increased health care utilization.[66] In patients with adverse social determinants of health, layering additional therapies for multimorbidity may worsen adherence in the most vulnerable by increasing their treatment burden.[67] Health care practitioners need to understand better how to calibrate treatments to meet both public health and patient health needs.

Hypertension control rates in Canada were among the highest in the world up to 2010, and these rates were associated with improved national ASCVD outcomes.[68] These rates of hypertension control and improved national outcomes were attributed in part to implementation projects such as continuing professional development programs leading to a more educated and integrated health care community.[69] More recently, however, hypertension control rates in women have fallen.[70] Although the specific reasons for this reduction are unknown, explanations include the loss of federal government support for hypertension surveillance, a fall in hypertension guideline implementation efforts, and the loss of industry sponsorship for education initiatives as generic medications have become more widely used.[71] Importantly, in the effort to understand why ASCVD outcomes worsen in any population, there is a paucity of data on the effectiveness of specific interventions to implement clinical practice guidelines and their effect on improving ASCVD patient outcomes.

How to implement physical activity recommendations at the individual, family and community level, leading to observable change nationally in health and wellness, requires much greater attention. Implementing physical activity and exercise recommendations is often done in a manner implying that failure to achieve some threshold will not allow the health benefits to accrue; Warburton and Bredin advocate a strengths-based approach in health and wellness promotion that focuses on the innate strengths of individuals, families and communities.[72] This approach has been increasingly used in Indigenous communities, including helping to build cultural competencies and culturally safe places.[72] The greatest relative benefits of physical activity come from doing some activity, rather than remaining sedentary.[22]

Limitations

This document is not a replacement for reading the individual guidelines. The C-CHANGE guideline is limited by the published literature, which is then evaluated for inclusion by individual guideline groups, and C-CHANGE must wait until the new evidence finds its way into its partners' guidelines. The C-CHANGE process tries to balance comprehensiveness with the risk of missing some recommendations that different partner groups felt were important. There is no adjustment of the original wording of the source recommendations within the C-CHANGE process; wording suggestions for future guideline recommendations are provided as feedback to partner guideline leads for potential incorporation in their next guideline development cycle.

Conclusion

C-CHANGE continues to meet its mandate from *The Canadian Heart Health Strategy and Action Plan* for guideline harmonization, expanding to 11 of Canada's cardiovascular-focused guideline groups to produce an implementable and actionable guideline to help address and individualize the cardiovascular management of patients with multimorbidity. We made purposeful efforts to engage patients throughout the C-CHANGE process in an integrated and meaningful way. Our approach strives to respect the principles of equity, diversity and inclusion and focuses on the delivery of comprehensive cardiovascular health and disease care in a primary care environment. C-CHANGE provides a uniquely Canadian platform to engage health care providers in improving their guideline-directed best practices, with the goal of improving patient health outcomes.

References

1. Tobe SW, Stone JA, Brouwers M, et al. Harmonization of guidelines for the prevention and treatment of cardiovascular disease: the C-CHANGE Initiative. *CMAJ* 2011;183:E1135-50.
2. Smith ER. The Canadian heart health strategy and action plan. *Can J Cardiol* 2009;25:451-2.
3. Tobe SW, Stone JA, Walker KM, et al. Canadian Cardiovascular Harmonized National Guidelines Endeavour (C-CHANGE): 2014 update. *CMAJ* 2014;186:1299-305.
4. Tobe SW, Stone JA, Anderson T, et al. Canadian Cardiovascular Harmonized National Guidelines Endeavour (C-CHANGE) guideline for the prevention and management of cardiovascular disease in primary care: 2018 update. *CMAJ* 2018;190:E1192-206.
5. Alam S, Lang JJ, Drucker AM, et al. Assessment of the burden of diseases and injuries attributable to risk factors in Canada from 1990 to 2016: an analysis of the Global Burden of Disease Study. *CMAJ Open* 2019;7:E140-8.
6. Lau D, McAlister FA. Implications of the COVID-19 pandemic for cardiovascular disease and risk-factor management. *Can J Cardiol* 2021;37:722-32.
7. Stanbrook MB, Kelsall D, MacDonald NE, et al. Early and continuing education: a prescription for achieving patient-centred care. *CMAJ* 2012;184:E3.
8. Canada's dietary guidelines for health professionals and policy makers. Ottawa: Health Canada; 2019. Available: https://food-guide.canada.ca/en/guidelines/ (accessed 2022 Aug. 1).
9. Rabi DM, McBrien KA, Sapir-Pichhadze R, et al. Hypertension Canada's 2020 comprehensive guidelines for the prevention, diagnosis, risk assessment, and treatment of hypertension in adults and children. *Can J Cardiol* 2020;36:596-624.
10. Gladstone DJ, Lindsay MP, Douketis J, et al. Canadian Stroke Best Practice recommendations: secondary prevention of stroke update 2020. *Can J Neurol Sci* 2022;49:315-37.
11. Stone JA, Arthur HM, Suskin N. Canadian guidelines for cardiac rehabilitation and cardiovascular disease. prevention: translating knowledge into action. Winnipeg: Canadian Association of Cardiac Rehabilitation; 2009.
12. Wharton S, Lau DC, Vallis M, et al. Obesity in adults: a clinical practice guideline. *CMAJ* 2020;192:E875-91.
13. Canadian smoking cessation clinical practice guideline. Toronto: Canadian Action Network for the Advancement, Dissemination and Adoption of Practice-informed Tobacco Treatment; 2011.
14. Lipscombe L, Butalia S, Dasgupta K, et al. Pharmacologic glycemic management of type 2 diabetes in adults: 2020 update. *Can J Diabetes* 2020;44:575-91.
15. Diabetes Canada Clinical Practice Guidelines Expert Committee. Diabetes Canada 2018 clinical practice guidelines for the prevention and management of diabetes in Canada. *Can J Diabetes* 2018;42(Suppl 1):S1-325.
16. Pearson GJ, Thanassoulis G, Anderson TJ, et al. Canadian Cardiovascular Society guidelines for the management of dyslipidemia for the prevention of cardiovascular disease in the adult. *Can J Cardiol* 2021;37:1129-50.
17. McDonald M, Virani S, Chan M, et al. CCS/CHFS heart failure guidelines update: defining a new pharmacologic standard of care for heart failure with reduced ejection fraction. *Can J Cardiol* 2021;37:531-46.
18. Ezekowitz JA, O'Meara E, McDonald MA, et al. 2017 Comprehensive update of the Canadian Cardiovascular Society guidelines for the management of heart failure. *Can J Cardiol* 2017;33:1342-433.
19. Andrade JG, Aguilar M, Atzema C, et al. The 2020 Canadian Cardiovascular Society/Canadian Heart Rhythm Society comprehensive guidelines for the management of atrial fibrillation. *Can J Cardiol* 2020;36:1847-948.

20. Ismail Z, Black SE, Camicioli R, et al. Recommendations of the 5th Canadian Consensus Conference on the diagnosis and treatment of dementia. *Alzheimers Dement* 2020;16:1182-95.
21. Singh GM, Micha R, Khatibzadeh S, et al. Estimated global, regional, and national disease burdens related to sugar-sweetened beverage consumption in 2010. *Circulation* 2015;132:639-66.
22. Warburton DE, Bredin SS. Reflections on physical activity and health: What should we recommend? *Can J Cardiol* 2016;32:495-504.
23. Sattelmair J, Pertman J, Ding EL, et al. Dose response between physical activity and risk of coronary heart disease: a meta-analysis. *Circulation* 2011;124:789-95.
24. Lavoie KL, Moullec G, Lemiere C, et al. Efficacy of brief motivational interviewing to improve adherence to inhaled corticosteroids among adult asthmatics: results from a randomized controlled pilot feasibility trial. *Patient Prefer Adherence* 2014;8:1555-69.
25. Mabire L, Mani R, Liu L, et al. The influence of age, sex and body mass index on the effectiveness of brisk walking for obesity management in adults: a systematic review and meta-analysis. *J Phys Act Health* 2017;14:389-407.
26. le Roux CW, Astrup A, Fujioka K, et al. 3 years of liraglutide versus placebo for type 2 diabetes risk reduction and weight management in individuals with prediabetes: a randomised, double-blind trial. *Lancet* 2017;389:1399-409.
27. Padwal R, Klarenbach S, Wiebe N, et al. Bariatric surgery: a systematic review and network meta-analysis of randomized trials. *Obes Rev* 2011;12:602-21.
28. Pasanisi F, Contaldo F, De Simone G, et al. Benefits of sustained moderate weight loss. *Nutr Metab Cardiovasc Dis* 2001;11:401-6.
29. Marso SP, Bain SC, Consoli A, et al. Semaglutide and cardiovascular outcomes in patients with type 2 diabetes. *N Engl J Med* 2016;375:1834-44.
30. Gerstein H, Colhoun H, Dagenais G, et al. Dulaglutide and cardiovascular outcomes in type 2 diabetes (REWIND): a double-blind, randomised placebo-controlled trial. *Lancet* 2019;394:121-30.
31. Wiviott SD, Raz I, Bonaca MP, et al. Dapagliflozin and cardiovascular outcomes in type 2 diabetes. *N Engl J Med* 2019;380:347-57.
32. Perkovic V, Jardine MJ, Neal B, et al. Canagliflozin and renal outcomes in type 2 diabetes and nephropathy. *N Engl J Med* 2019;380:2295-306.
33. Wanner C, Inzucchi SE, Lachin JM, et al. Empagliflozin and progression of kidney disease in type 2 diabetes. *N Engl J Med* 2016;375:323-34.
34. Zinman B, Wanner C, Lachin JM, et al. Empagliflozin, cardiovascular outcomes, and mortality in type 2 diabetes. *N Engl J Med* 2015;373:2117-28.
35. Lee DS, Chiu M, Manuel DG, et al. Trends in risk factors for cardiovascular disease in Canada: temporal, socio-demographic and geographic factors. *CMAJ* 2009;181:E55-66.
36. Yusuf S, Hawken S, Ounpuu S, et al. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. *Lancet* 2004;364:937-52.
37. Yusuf S, Bosch J, Dagenais G, et al. Cholesterol lowering in intermediate-risk persons without cardiovascular disease. *N Engl J Med* 2016;374:2021-31.
38. Verheugt FW, Ten Berg JM, Storey RF, et al. Antithrombotics: from aspirin to DOACs in coronary artery disease and atrial fibrillation (Part 3/5). *J Am Coll Cardiol* 2019;74:699-711.
39. Sabatine MS, Giugliano RP, Keech AC, et al. Evolocumab and clinical outcomes in patients with cardiovascular disease. *N Engl J Med* 2017;376:1713-22.
40. Bassi NS, Ziaeian B, Yancy CW, et al. Association of optimal implementation of sodium-glucose cotransporter 2 inhibitor therapy with outcome for patients with heart failure. *JAMA Cardiol* 2020;5:948-51.
41. Smith EE. Clinical presentations and epidemiology of vascular dementia. *Clin Sci (Lond)* 2017;131:1059-68.
42. Roberts K, Rao D, Bennett T, et al. Prevalence and patterns of chronic disease multimorbidity and associated determinants in Canada. *Health Promot Chronic Dis Prev Can* 2015;35:87-94.
43. Lichtman JH, Bigger Jr JT, Blumenthal JA, et al. Depression and coronary heart disease: recommendations for screening, referral, and treatment: a science advisory from the American Heart Association Prevention Committee of the Council on Cardiovascular Nursing, Council on Clinical Cardiology, Council on Epidemiology and Prevention, and Interdisciplinary Council on Quality of Care and Outcomes Research: endorsed by the American Psychiatric Association. *Circulation* 2008;118:1768-75.
44. Levine GN, Cohen BE, Commodore-Mensah Y, et al. Psychological health, well-being, and the mind-heart-body connection: a scientific statement from the American Heart Association. *Circulation* 2021;143:e763-83.
45. Lichtman JH, Froelicher ES, Blumenthal JA, et al. Depression as a risk factor for poor prognosis among patients with acute coronary syndrome: systematic review and recommendations: a scientific statement from the American Heart Association. *Circulation* 2014;129:1350-69.
46. Vaccarino V, Badimon L, Bremner JD, et al. Depression and coronary heart disease: 2018 position paper of the ESC working group on coronary pathophysiology and microcirculation. *Eur Heart J* 2020;41:1687-96.
47. Brouwers MC, Kho ME, Browman GP, et al. Development of the AGREE II, part 1: performance, usefulness and areas for improvement. *CMAJ* 2010;182:1045-52.
48. Brouwers MC, Kho ME, Browman GP, et al. Development of the AGREE II, part 2: assessment of validity of items and tools to support application. *CMAJ* 2010;182:E472-8.
49. Jones J, Hunter D. Consensus methods for medical and health services research. *BMJ* 1995;311:376-80.
50. Guyatt G, Gutterman D, Baumann MH, et al. Grading strength of recommendations and quality of evidence in clinical guidelines: report from an American college of chest physicians task force. *Chest* 2006;129:174-81.
51. Rabi DM, Daskalopoulou SS, Padwal RS, et al. The 2011 Canadian Hypertension Education Program recommendations for the management of hypertension: blood pressure measurement, diagnosis, assessment of risk, and therapy. *Can J Cardiol* 2011;27:415-433.e1.e1-2.
52. Lindsay MP, Gierman N, Harris JE, et al. People with lived experience at the centre of Canadian Stroke Best Practice recommendations: a model for guideline developers. *J Patient Exp* 2020;7:951-6.
53. Schünemann HJ. Guidelines International Network: principles for disclosure of interests and management of conflicts in guidelines. *Ann Intern Med* 2015;163:548-53.
54. Kelsall D. New *CMAJ* policy on competing interests in guidelines. *CMAJ* 2019;191:E350-1.
55. Drazen JM, de Leeuw PW, Laine C, et al. Toward more uniform conflict disclosures: updated ICMJE conflict of interest reporting form. *CMAJ* 2010;182:E425.
56. Tu JV, Maclagan LC, Ko DT, et al. The Cardiovascular Health in Ambulatory Care Research Team performance indicators for the primary prevention of cardiovascular disease: a modified Delphi panel study. *CMAJ Open* 2017;5:E315-21.
57. SPRINT Research Group; Wright JT Jr, Williamson JD, Whelton PK, et al. A randomized trial of intensive versus standard blood-pressure control. *N Engl J Med* 2015;373:2103-16.
58. Tomson CRV, Cheung AK, Mann JFE, et al. Management of blood pressure in patients with chronic kidney disease not receiving dialysis: synopsis of the 2021 KDIGO clinical practice guideline. *Ann Intern Med* 2021;174:1270-81.
59. Hanssen H, Boardman H, Deiseroth A, et al. Personalized exercise prescription in the prevention and treatment of arterial hypertension: a consensus document from the European Association of Preventive Cardiology (EAPC) and the ESC Council on Hypertension. *Eur J Prev Cardiol* 2022;29:205-15.
60. Jones NR, McCormack T, Constanti M, et al. Diagnosis and management of hypertension in adults: NICE guideline update 2019. *Br J Gen Pract* 2020;70:90-1.
61. KDIGO. KDIGO 2021 clinical practice guideline for the management of blood pressure in chronic kidney disease. *Kidney Int* 2021;99(Suppl 3):S1-S87.
62. American Diabetes Association. 10. Cardiovascular disease and risk management: *standards of medical care in diabetes — 2021. Diabetes Care* 2021;44(Suppl 1): S125-S150.
63. Hindricks G, Potpara T, Dagres N, et al.; ESC Scientific Document Group. 2020 ESC guidelines for the diagnosis and management of atrial fibrillation developed in collaboration with the European Association for Cardio-Thoracic Surgery (EACTS): The Task Force for the diagnosis and management of atrial fibrillation of the European Society of Cardiology (ESC) Developed with the special contribution of the European Heart Rhythm Association (EHRA) of the ESC. *Eur Heart J* 2021;42:373-498.
64. McDonagh TA, Metra M, Adamo M, et al. 2021 ESC guidelines for the diagnosis and treatment of acute and chronic heart failure. *Eur Heart J* 2021;42:3599-726.
65. Bull FC, Al-Ansari SS, Biddle S, et al. World Health Organization 2020 guidelines on physical activity and sedentary behaviour. *Br J Sports Med* 2020;54:1451-62.
66. St John PD, Menec V, Tyas SL, et al. Multimorbidity in Canadians living in the community: results from the Canadian Longitudinal Study of Aging. *Can Fam Physician* 2021;67:187-97.
67. Boehmer KR, Abu Dabrh AM, Gionfriddo MR, et al. Does the chronic care model meet the emerging needs of people living with multimorbidity? A systematic review and thematic synthesis. *PLoS One* 2018;13:e0190852.
68. Tobe SW, Campbell NR, Padwal RS, et al. Change of education strategy associated with slippage in Canadian hypertension awareness treatment and control rates. *J Hum Hypertens* 2021;35:1054-6.
69. Campbell NRC, Brant R, Johansen H, et al. Increases in antihypertensive prescriptions and reductions in cardiovascular events in Canada. *Hypertension* 2009;53:128-34.
70. Leung AA, Williams JVA, McAlister FA; Hypertension Canada's Research and Evaluation Committee, et al. Worsening hypertension awareness, treatment, and control rates in Canadian women between 2007 and 2017. *Can J Cardiol* 2020;36:732-9.
71. Leung AA, Bell A, Tsuyuki RT, et al. Refocusing on hypertension control in Canada. *CMAJ* 2021;193:E854-5.
72. Warburton DE, Bredin SS. Health benefits of physical activity: a strengths-based approach. *J Clin Med* 2019;8:2044.

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