Appendix 1 (as supplied by the authors): Complete Set of 2018 C-CHANGE Harmonized CVD Guidelines

2018 C-CHANGE Harmonized CVD Guidelines

New New/Updated Recommendation 2018

Acronyms/ Guideline Group

1. **Obesity** = Canadian Association of Bariatric Physicians and Surgeons, Obesity Canada
2. **HC** = Hypertension Canada (formerly Canadian Hypertension Education Program/CHEP)
3. **HF** = Canadian Cardiovascular Society Guidelines for the Management of Heart Failure
4. **CCS** = Canadian Cardiovascular Society Guidelines for the Management of Dyslipidemia
5. **DC** = Diabetes Canada (formerly Canadian Diabetes Association/CDA)
6. **Stroke** = Heart and Stroke Foundation
7. **CSEP** = Canadian Society for Exercise Physiology
8. **CACPR** = Canadian Association of Cardiovascular Prevention and Rehabilitation

Table 1. Body Habitus

All

- Height, weight and waist circumference should be measured and body mass index calculated for all adults.[1]
- Maintenance of a healthy body weight (body mass index 18.5 to 24.9 kg/m2, and waist circumference less than 102 cm for men and less than 88 cm for women) is recommended for nonhypertensive individuals to prevent hypertension and for hypertensive patients to reduce blood pressure. All overweight hypertensive individuals should be advised to lose weight.[2]

Heart Failure

New We suggest daily morning weight should be monitored in patients with heart failure, with fluid retention or congestion that is not easily controlled with diuretics, or in patients with significant renal dysfunction.[3]

Overweight/obesity

- Measuring body mass index (BMI = weight[kg]/height[m]2) in children aged two to seventeen years.[1]

Table 2. Diet, Sodium and Alcohol Intake

All

- To prevent hypertension and reduce BP in hypertensive adults, individuals should limit alcohol consumption to 2 drinks per day, and consumption should not exceed 14 standard drinks per week for men and 9 standard drinks per week for women.[2]

New To prevent hypertension and reduce BP in hypertensive adults, consider reducing sodium intake toward 2000 mg (5 g of salt or 87 mmol of sodium) per day.[2]

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New We suggest that all individuals be encouraged to moderate energy (caloric) intake to achieve and maintain a healthy body weight and adopt a healthy dietary pattern to lower their CVD risk:[4]

- Mediterranean dietary pattern
- Portfolio dietary pattern
- DASH dietary pattern
- Dietary patterns high in nuts (≥ 30 g/d);
- Dietary patterns high in legumes (≥ 4 servings per week;
- Dietary patterns high in olive oil (≥ 60 mL/ d);
- Dietary patterns rich in fruits and vegetables (≥ 5 servings per day);
- Dietary patterns high in total fibre (≥ 30 g/d); and whole grains (≥ 3 servings per day)
- Low glycemic load or low GI dietary patterns;
- Vegetarian dietary patterns

Diabetes

New People with diabetes should be offered timely SME (self-management education) that is tailored to enhance self-care practices and behaviours.[5]

Overweight/Obesity

New A dietary plan for improving health for adults with obesity should be part of a weight management strategy.[1]

New A comprehensive healthy lifestyle intervention is recommended for people with overweight and obesity.[1]

Table 3. Risk Factor Screening

All

- All individuals should be evaluated annually for type 2 diabetes risk on the basis of demographic and clinical criteria.[5]

New Screening for diabetes using FPG and/or A1C should be performed every 3 years in individuals ≥ 40 years of age or at high risk using a risk calculator. Earlier testing and/or more frequent follow-up (every 6 to 12 months) with either FPG and/or A1C 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.[5]

New Risk factors for type 2 diabetes:[5]

- Age ≥40 years
- First-degree relative with type 2 diabetes
- Member of high-risk population (e.g., African, Arab, Asian, Hispanic, Indigenous or South Asian descent, low socioeconomic status)
- History of prediabetes (IGT, IFG or A1C 6.0–6.4%)*
- History of GDM
- History of delivery of a macrosomic infant
- Presence of end organ damage associated with diabetes:
  - Microvascular (retinopathy, neuropathy, nephropathy)
  - CV (coronary, cerebrovascular, peripheral)

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- Presence of vascular risk factors:
  - HDL-C<1.0 mmol/L in males, <1.3 mmol/L in females*
  - TG ≥1.7 mmol/L*
  - Hypertension*
  - Overweight*
  - Abdominal obesity*
  - Smoking
- Presence of associated diseases:
  - History of pancreatitis
  - Polycystic ovary syndrome*
  - Acanthosis nigricans*
  - Hyperuricemia/gout
  - Non-alcoholic steatohepatitis
  - Psychiatric disorders (bipolar disorder, depression, schizophrenia†)
  - HIV infection‡
  - Obstructive sleep apnea§
  - Cystic fibrosis
- Use of drugs associated with diabetes:
  - Glucocorticoids
  - Atypical antipsychotics
  - Statins
  - Highly active antiretroviral therapy‡
  - Anti-rejection drugs

New Testing with 2hPG in a 75 g OGTT may be considered in individuals with FPG 6.1-6.9 mmol/L and/or A1C 6.0%-6.4% in order to identify individuals with IGT or diabetes.[5]

- Health care professionals who have been specifically trained to measure blood pressure (BP) accurately should assess BP in all adult patients at all appropriate visits to determine cardiovascular risk and monitor antihypertensive treatment.[2]

New Use of standardized measurement techniques and validated equipment for all methods (automated office BP [AOBP], non-AOBP, home BP monitoring, and ambulatory BP monitoring) is recommended. Measurement using electronic (oscillometric) upper arm devices is preferred over auscultation. (Unless specified otherwise, electronic [oscillometric] measurement should be used.)[5]

New Four approaches can be used to assess BP:[5]

- AOBP is the preferred method of performing in-office BP measurement. When using AOBP, a displayed mean systolic BP (SBP) ≥ 135 mm Hg or diastolic BP (DBP) ≥ 85 mm Hg DBP is high.
- When using non-AOBP, a mean SBP ≥140 mm Hg or DBP ≥ 90 mm Hg is high, and an SBP between 130 and 139 mm Hg and/or a DBP between 85 and 89 mm Hg is high-normal.
- Using ambulatory BP monitoring, patients can be diagnosed as hypertensive if the mean awake SBP is ≥ 135 mm Hg or the DBP is ≥ 85 mm Hg or if the mean 24-hour SBP is ≥ 130 mm Hg or the DBP is ≥ 80 mm Hg.

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- Using home BP monitoring patients can be diagnosed as hypertensive if the mean SBP is ≥135 mm Hg or the DBP is ≥ 85 mm Hg. If the office BP measurement is high and the mean home BP is < 135/85 mm Hg, it is advisable to either repeat home monitoring to confirm the home BP is < 135/85 mm Hg or perform 24-hour ambulatory BP monitoring to confirm that the mean 24-hour ambulatory BP monitoring is < 130/80 mm Hg and the mean awake ambulatory BP monitoring is < 135/85 mm Hg before diagnosing white coat hypertension.

New Screening of plasma lipids for men ≥40 years of age; women ≥40 years of age (or postmenopausal). Consider earlier in ethnic groups at increased risk such as South Asian or First Nations individuals.[4]

New Screen lipids at any age for:[4]

- Clinical evidence of atherosclerosis,
- Abdominal aortic aneurysm
- Diabetes mellitus
- Arterial hypertension
- Current cigarette smoking
- Stigmata of dyslipidemia (arcus cornealis xanthelasma or xanthoma)
- Family history of CVD*
- Chronic kidney disease**
- Obesity (BMI ≥30 kg/m2)
- Inflammatory disease
- HIV infection
- Erectile dysfunction
- Chronic obstructive pulmonary disease
- Hypertensive diseases of pregnancy

*Men < 55 years and women < 65 of age in first degree relative.
**KD: eGFR <60 ml/min/1.73 m2 or ACR >3 mg/mmol for at least 3 months duration.

New Tobacco use status of all patients should be updated on a regular basis and health care providers should clearly advise patients to quit smoking.[3]

New Consider informing patients of their global 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.[2]

Heart Failure

New We recommend that patients with known or suspected HF should be assessed for multimorbidity, frailty, cognitive impairment, dementia and depression, all of which may affect treatment, adherence to therapy, follow-up or prognosis.[3]

Hypertension

New Global cardiovascular risk should be assessed. Multifactorial risk assessment models can be used to:[2]

- Predict more accurately an individual's global cardiovascular risk;
- Help engage individuals in conversations about health behaviour change to lower blood pressure;
- Use antihypertensive therapy more efficiently.

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In the absence of Canadian data to determine the accuracy of risk calculations, avoid using absolute levels of risk to support treatment decisions.[2]

Overweight/Obesity

New Screening for eating disorders, depression and psychiatric disorders, as appropriate.[1]

Stroke

New Persons 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), as well as use of oral contraceptives or hormone replacement therapy[6]

New Persons at risk of stroke should receive information and counseling about possible strategies to modify their lifestyle and risk factors[6]

New Referrals to appropriate specialists should be made where required. The specialists may provide more comprehensive assessments and structured programs to manage specific risk factors.[6]

Table 4. Diagnostic Strategies

Diabetes

New Diabetes should be diagnosed by any of the following criteria:[5]

- FPG ≥7.0 mmol/L
- A1C ≥6.5% (for use in adults in the absence of factors that affect the accuracy of A1C and not for use in those with suspected type 1 diabetes)
- 2hPG in a 75 g OGTT ≥11.1 mmol/L
- Random PG ≥11.1 mmol/L.

Heart Failure

New 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.[4]

New We recommend that patients who receive potentially cardiotoxic cancer therapy undergo evaluation of LV ejection fraction (LVEF) before initiation of cancer treatments known to cause impairment in LV function.[4]

Hypertension

New Routine laboratory tests that should be performed for the investigation of all patients with hypertension include the following:[2]

- Urinalysis;
- Blood chemistry (potassium, sodium, and creatinine;
- Fasting blood glucose and/or glycated hemoglobin;
- Serum total cholesterol, low-density lipoprotein, highdensity lipoprotein, non-high-density lipoprotein cholesterol, and triglycerides; lipids may be drawn fasting or nonfasting;
- Standard 12-lead electrocardiography.

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- Patients with hypertension and evidence of heart failure should have an objective assessment of left ventricular ejection fraction, either by echocardiogram or nuclear imaging.[2]
- The use of home blood pressure monitoring on a regular basis should be considered for patients with hypertension, particularly those with:[2]
    - Diabetes mellitus;
    - Chronic kidney disease;
    - Suspected nonadherence;
    - Demonstrated white coat effect;
    - BP controlled in the office but not at home (masked hypertension).

New Standardized office BP measurement should be used for follow up. Measurement using electronic (oscillometric) upper arm devices is preferred over auscultation.[2]

New In patients with large arm circumference when standard upper arm measurement methods cannot be used, validated wrist devices (utilized with arm and wrist supported at heart level) may be used for blood pressure estimation.[2]

Overweight/Obesity

- Additional investigations, such as liver enzyme tests, and sleep studies (when appropriate), to screen for and exclude other common overweight/obesity-related health problems.[1]

Table 5. Risk Stratification

All

New We recommend that a CV risk assessment be completed every 5 years for men and women aged 40 to 75 years 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.[4]

New We recommend calculating and discussing a patient's "Cardiovascular Age" to improve the likelihood that patients will reach lipid targets and that poorly controlled hypertension will be treated.[4]

New We recommend sharing the results of the risk assessment with the patient to support shared decision-making and improve the likelihood that patients will reach lipid targets.[4]

Table 6. Treatment Targets

All

- To achieve health benefits, adults aged 18–64 years should aim to accumulate at least 150 min of moderate-to-vigorous-intensity aerobic physical activity per week, in bouts of 10 min or more.[7]
- It is also beneficial to add muscle- and bone-strengthening activities that use major muscle groups, at least two days per week.[7]
- More physical activity provides greater health benefits.[7]

Diabetes

- All individuals with diabetes should follow a comprehensive, multifaceted approach to reduce CV risk, including:[5]
    - A1C ≤7.0% implemented early in the course of diabetes

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- Systolic BP of <130 mmHg and diastolic BP of <80 mmHg
- Additional vascular-protective medications in the majority of adult people with diabetes) for those with type 2 diabetes age >40 years with albuminuria;
- Achievement and maintenance of healthy weight goals
- Healthy eating
- Regular physical activity
- Smoking cessation

New Therapy in most individuals with type 1 or type 2 diabetes should be targeted to achieve an A1C ≤ 7.0% in order to reduce the risk of microvascular and, if implemented early in the course of disease, CV complications.[5]

New In people with type 2 diabetes, an A1C ≤6.5% may be targeted to reduce the risk of CKD and retinopathy if they are assessed to be at low risk of hypoglycemia based on class of antihyperglycemic medication(s) utilized and the person's characteristics.[5]

New A higher A1C target may be considered in people with diabetes with the goals of avoiding hypoglycemia and over-treatment related to antihyperglycemic therapy, with any of the following:[5]

- Functionally dependent: 7.1%–8.0%
- History of recurrent severe hypoglycemia, especially if accompanied by hypoglycemia unawareness: 7.1%–8.5%
- Limited life expectancy: 7.1%–8.5%
- Frail elderly and/or with dementia: 7.1%–8.5%
- End of life: A1C measurement not recommended. Avoid symptomatic hyperglycemia and any hypoglycemia.

New An intensive healthy behaviour intervention program, combining dietary modification and increased physical activity, may be used to achieve weight loss, improve glycemic control and reduce CV risk.[5]

Dyslipidemia

New We recommend a target LDL-C consistently < 2.0 mmol/L or > 50% reduction of LDL-C in individuals for whom treatment is initiated to decrease the risk of CVD events.[4]

New Alternative target variables are apoB < 0.8 g/L or non- HDL-C < 2.6 mmol/L.[4]

New We recommend a > 50% reduction of LDL-C for patients with LDL-C > 5.0 mmol/L in individuals for whom treatment is initiated to decrease the risk of CVD events and mortality.[4]

Hypertension

New For non-hypertensive individuals (to reduce the possibility of becoming hypertensive) or for hypertensive patients (to reduce their BP), prescribe the accumulation of 30-60 minutes of moderate intensity dynamic exercise (e.g., walking, jogging, cycling, or swimming) 4-7 days per week in addition to the routine activities of daily living.[2]

New 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.[2]

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New 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.[2]

New Antihypertensive therapy should be strongly considered for average DPB readings ≥ 90 mm Hg or for average SBP readings ≥ 140 mm Hg in the presence of macrovascular target organ damage or other independent cardiovascular risk factors.[2]

New Persons 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).[5]

Obesity

New Light activity and gradual increases is recommended when initiating activity from previously sedentary state. All those considering initiating a vigorous exercise program are encouraged to consult their physician or health care team professionals.[1]

Stroke

New After the acute phase of a stroke, BP-lowering treatment is recommended to a target of consistently <140/90 mm Hg.[2]

Table 7. Pharmacologic and/or Procedural Therapy for CVD Risk Reduction

Coronary Artery Disease/Ischaemic Heart Disease

New In people with established CVD, low-dose ASA therapy (81-162 mg) should be used to prevent CV events.[5]

- Cardiac rehabilitation programs and services are recommended for most, and potentially all, patients with documented cardiovascular disease.[8]

Diabetes

New Statin therapy should be used to reduce CV risk in adults with type 1 or type 2 diabetes with any of the following features:[5]
    - Clinical CVD
    - Age ≥40 years
    - Age <40 years and 1 of the following:
        - Diabetes duration >15 years and age >30 years
        - Microvascular complications
        - Warrants therapy based on the presence of other CV risk factors according to the 2016 Canadian Cardiovascular Society Guidelines for the Diagnosis and Treatment of Dyslipidemia.

New In adults with type 2 diabetes with clinical CVD in whom glycemic targets are not achieved with existing antihyperglycemic medication, an antihyperglycemic agent with demonstrated CV outcome benefit (empagliflozin, liraglutide, canagliflozin) should be added to reduce the risk of major CV events.[5]
    - An SGLT2 inhibitor with demonstrated heart failure hospitalization reduction may be added to reduce the risk of heart failure hospitalization.

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New ACE inhibitor 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:[5]

- Clinical CVD
- Age ≥55 years with an additional CV risk factor or end organ damage (albuminuria, retinopathy, left ventricular hypertrophy)
- Microvascular complications.

Dyslipidemia

New We recommend management that includes statin therapy in high-risk conditions including clinical atherosclerosis, abdominal aortic aneurysm, most DM, CKD (age older than 50 years), and those with LDL-C ≥ 5.0 mmol/L to decrease the risk of CVD events and mortality.[4]

New For individuals not at LDL-C goal despite statin therapy as described above, a combination of statin therapy with second-line agents may be used to achieve the goal and the agent used should be selected based upon the size of the existing gap to LDL-C goal. [5]

New We recommend management that includes statin therapy for individuals at high risk (modified FRS ≥ 20%) to decrease the risk of CVD events.[4]

New We recommend management that includes statin therapy for individuals at IR (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 IR persons 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 60 years of age and older with ≥ 1 CV risk factor.[4]

Heart Failure

New We recommend that most patients with HFrEF be treated with triple therapy including an ACEi (or an ARB in those that are ACEi intolerant), a beta-blocker and a MRA unless specific contraindications exist.[3]

New We recommend loop diuretics be used to control symptoms of congestion and peripheral edema.[3]

New We suggest that NOACs should be the agent of choice for stroke prophylaxis in patients with HF and non-valvular AF, and that the treatment dose be guided by patient specific characteristics including age, weight and renal function.[3]

New We recommend that an (Angiotensin Receptor Neprilysin Inhibitor) ARNI be used in place of an ACEi or ARB, in patients with HFrEF, who remain symptomatic despite treatment with appropriate doses of GDMT to decrease cardiovascular death, HF hospitalizations, and symptoms.[3]

Hypertension

New Initial therapy should be with either monotherapy or single pill combination (SPC).[2]

- Recommended monotherapy choices are:
  - A thiazide/thiazide-like diuretic, with longer-acting diuretics preferred,
  - A β-blocker (in patients younger than 60 years),
  - An angiotensin converting enzyme (ACE) inhibitor (in non-black patients;),
  - An angiotensin receptor blocker (ARB), or
  - A long-acting calcium channel blocker (CCB).

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  - Recommended SPC choices are those in which an ACE inhibitor is combined with a CCB, ARB with a CCB, or ACE inhibitor or ARB with a diuretic).
  - Hypokalemia should be avoided in patients treated with thiazide/thiazide-like diuretic monotherapy.

- Additional antihypertensive drugs should be used if target blood pressure levels are not achieved with standard dose monotherapy. Add-on drugs should be chosen from first line choices. Useful choices include a thiazide/thiazide-like diuretic or CCB with either: an ACE inhibitor, ARB or beta-blocker. Caution should be exercised in combining a nondihydropyridine CCB and a beta-blocker. The combination of an ACE inhibitor and ARB is not recommended.[2]

New Alpha-blockers are not recommended as first-line agents for uncomplicated hypertension; beta blockers are not recommended as first-line therapy for uncomplicated hypertension in patients aged 60 years or older; and ACE inhibitors are not recommended as first-line therapy for uncomplicated hypertension in black patients. However, these agents may be used in patients with certain comorbid conditions or in combination therapy.[2]

- Thiazide/thiazide-like diuretics are recommended as additive antihypertensive therapy. For patients with chronic kidney disease and volume overload, loop diuretics are an alternative.[2]
- For persons with cardiovascular or kidney disease, including microalbuminuria or with cardiovascular risk factors in addition to diabetes and hypertension, an ACE inhibitor or an ARB is recommended as initial therapy.[2]
- An ARB is recommended if ACE inhibitors are not tolerated.[2]
- For hypertensive patients whose BP is not controlled, an ARB may be combined with an ACE inhibitor and other antihypertensive drug treatment. Careful monitoring should be used if combining an ACE inhibitor and an ARB because of potential adverse effects such as hypotension, hyperkalemia and worsening renal function. Additional therapies may also include dihydropyridine CCBs.[2]
- For most hypertensive patients with CAD, an ACE inhibitor or ARB is recommended.[2]
- For high-risk hypertensive patients, when combination therapy is being used, choices should be individualized. The combination of an ACE inhibitor and a dihydropyridine CCB is preferable to an ACE inhibitor and a thiazide/thiazide-like diuretic in selected patients.[2]

New For patients with stable angina pectoris but without prior HF, MI or coronary artery bypass surgery, either a beta blocker or a CCB can be used as initial therapy.[2]

- For patients with recent myocardial infarction, initial therapy should include both a β-blocker and an ACE inhibitor. An ARB can be used if the patient is intolerant of an ACE inhibitor.[2]

Overweight/Obesity

- Adults with class III overweight/obesity (BMI ≥ 40.0 kg/m2) or class II overweight/obesity (BMI 35.0 to 39.9 kg/m2) with other comorbidities may be considered for bariatric surgery when other lifestyle interventions are inadequate in achieving weight goals.[1]
- Primary care health professionals are encouraged to create a nonjudgmental atmosphere when discussing weight management.[1]

Stroke

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- Strong consideration should be given to the initiation of antihypertensive therapy after the acute phase of a stroke or transient ischemic attack.[2]
- Antiplatelet therapy: all patients with ischemic stroke or transient ischemic attack should be prescribed antiplatelet therapy for secondary prevention of recurrent stroke unless there is an indication for anticoagulation.[6]

New ASA (80mg - 325 mg), combined ASA (25 mg) and extended-release dipyridamole (200 mg), or clopidogrel (75 mg) are all appropriate options and selection should depend on the clinical circumstances.[6]

New Patients with transient ischemic attack or ischemic stroke and non-valvular atrial fibrillation should receive oral anticoagulation.[6]

New In most patients requiring anticoagulants for atrial fibrillation, direct non-vitamin K oral anticoagulants (DOAC) should be prescribed in preference over warfarin.[6]

New When selecting choice of oral anticoagulants, patient specific criteria should be considered.[6]

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