DYSLIPIDEMIA

2016 UPDATE

The Canadian Cardiovascular Society's

DYSLIPIDEMIA GUIDELINES

DYSLIPIDEMIA

Canadian Cardiovascular Society
Leadership. Knowledge. Community.

About this Pocket Guide

This pocket guide is a quick-reference tool that features diagnostic and treatment recommendations based on the CCS Dyslipidemia Guidelines (2006, 2009, 2012 and 2016).

These recommendations are intended to provide a reasonable and practical approach to care for specialists, physicians and allied health professionals. They are subject to change as scientific knowledge and technology advance and practice patterns evolve, and are not intended to be a substitute for clinical judgement. Adherence to these recommendations will not necessarily produce successful outcomes in every case.

For information about the GRADE approach for rating the strength of recommendations and quality of evidence, visit ccs.ca.

Please visit www.ccs.ca for more information and additional resources.

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Summary of 2016 Guideline Changes and Highlights

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- Risk assessment using FRS and CLEM *(page 6)*
- Broader treatment recommendations for those in intermediate risk category (includes statin indicated conditions) *(page 9)*
- Expanded definition of CKD as high-risk phenotype *(page 9)*
- New targets: LDL-C <2.0 mmol/L for individuals for whom treatment is initiated, or consider more aggressive targets of LDL-C <1.8 mmol/L for recent ACS patients *(page 13)*
- New recommendations for non-statin drugs *(page 15)*
- Nutritional guidelines that focus on dietary patterns – Mediterranean, DASH or Portfolio diet *(page 17)*
- Detailed review of the impact of nutritional components on lipids and CV events *(page 19)*

LDL-C – low density lipoprotein cholesterol; CKD – chronic kidney disease; DASH – Dietary Approaches to Stop Hypertension - HDP - Hypertensive diseases of pregnancy

Key Messages

- LDL-cholesterol levels are directly linked to the development of atherosclerosis and its reduction is directly linked to the reduction in cardiovascular disease events
- Health behaviour modification remains a cornerstone of risk reduction

WHO TO SCREEN

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

All patients with the following conditions regardless of age:

- 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 premature CVD*
- Family history of dyslipidemia
- Chronic kidney disease**
- Obesity (BMI ≥30 kg/m^2)
- Inflammatory disease
- HIV infection
- Erectile dysfuntion
- Chronic obstructive pulmonary disease
- Hypertensive diseases of pregnancy

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

HOW TO SCREEN

For all:

- History and physical examination
- Standard lipid panel (TC, LDL-C, HDL-C, TG)
- Non-HDL-C (will be calculated from profile)
- Glucose
- eGFR

Optional:

- ApoB
- Urine albumin:creatinine ratio (if eGFR <60 mL/min/1.73m^2, hypertension or diabetes)

LIPID TESTING CAN GENERALLY BE DONE NON-FASTING

RECOMMENDATION

- We recommend non-fasting lipid and lipoprotein testing which can be performed in adults in whom screening is indicated as part of a comprehensive risk assessment to reduce CVD events *(Strong Recommendation, High Quality Evidence).*

- We suggest that for individuals with a history of triglyceride levels >4.5 mmol/L that lipid and lipoprotein levels be measured fasting *(Conditional Recommendation, Low Quality Evidence).*

Pratical Tip - Compared to fasting lipid values, there will be minimal change with non-HDL-C, a slight decrease in LDL-C and small increase in triglyceride concentrations when most individuals do not fast.

Coronary Artery Calcium (CAC) Measurement - Recommendations

- We suggest that CAC screening by CT may be appropriate for asymptomatic, middle-aged adults (FRS 10-20%) where treatment decisions are uncertain *(Conditional Recommendation, Moderate Quality Evidence).*
- We suggest that CAC screening by CT not be undertaken for a) high risk individuals b) patients on statin treatment or c) most asymptomatic, low-risk adults *(Strong Recommendation, Moderate Quality Evidence).*
- We suggest that CAC screening might be considered for a subset of low-risk middle aged individuals with a family history of premature CHD (male <55 years; female <65 years) *(Conditional Recommendation, Low Quality Evidence).*
- We suggest that in patients warranting risk factor management based on usual criteria, CAC scoring not be undertaken. Moreover, CAC scoring (seeking a result with a value of zero) should not be used as a rationale for withholding otherwise indicated, preventive therapies *(Strong recommendation, Low Quality Evidence).*

Lipoprotein (a) Measurement - Recommendation

- We suggest that Lp(a) may aid risk assessment in subjects at intermediate Framingham risk or with a family history of premature CAD *(Conditional Recommendation, Moderate Quality Evidence).*

Values and preferences - Lp(a) is a marker of CVD risk. Particular attention should be given to individuals with Lp(a) levels above 30 mg/dL for whom CVD risk is increased by approximately 2 fold. Although no randomized clinical trials support basing treatment decisions solely on an elevated Lp(a), high levels of Lp(a) may be particularly useful for mutual decision-making in the situation indicated above. Moreover, in younger patients with a very strong family history of premature CVD suspected to be related to atherogenic dyslipidemia but who may not meet usual risk criteria for treatment, detection of high Lp(a) may help inform mutual decision making regarding treatment. Lp(a) is not considered a treatment target and repeat measures are not indicated.

Risk Assessment for Primary Prevention

RISK ASSESSMENT, STRATIFICATION & TREATMENT CONSIDERATION

Calculate risk (unless statin-indicated condition) using the Framingham Risk Score (FRS)[†] or Cardiovasular Life Expectancy Model (CLEM)[†]

Repeat screening every 5 years for FRS <5% or every year for FRS ≥5%

RECOMMENDATIONS

- We recommend that a cardiovascular risk assessment be completed every 5 years for men and women age 40 to 75 using the modified Framingham risk score or Cardiovascular Life Expectancy Model to guide therapy to reduce major cardiovascular events. A risk assessment may also be completed whenever a patient's expected risk status changes *(Strong Recommendation, High Quality Evidence).*
- 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 *(Strong Recommendation, High Quality Evidence).*

Pratical Tip - While there is good evidence to support the use of statins in secondary prevention in patients over the age of 75 years for some outcomes, a mortality benefit has not been demonstrated. In addition, the evidence for statin use in primary prevention is lacking in this population, mainly because they have not been extensively studied.

[†] **Can calculate Cardiovascular Age with the Cardiovascular Life Expectancy Model at: www.chiprehab.com**
For mobile device applications from the CCS, please visit: www.ccs.ca
FRS calculator: myhealthcheckup.com

Statin-indicated Conditions‡

- **Clinical atherosclerosis**
- **Abdominal aortic aneurysm**
- **Most diabetes including:**
  - Age ≥40y
  - Age ≥30y & 15y duration (type 1 DM)
  - Microvascular disease
- **Chronic kidney disease**

LDL-C ≥5mmol/L
(genetic dyslipidemia)

Primary Prevention Conditions

Intermediate Risk
FRS 10-19% and
LDL-C ≥3.5 mmol/L or
Non-HDL-C ≥4.3 mmol/L or
ApoB ≥1.2 g/L or
Men ≥50 and women ≥60 with one additional risk factor: low HDL-C, impaired fasting glucose, high waist circumference, smoker, hypertension

High Risk
FRS ≥20%
or
alternative method

No Pharmacotherapy

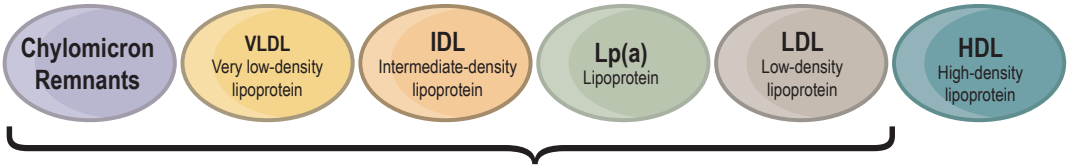
Low Risk
FRS <10%

‡ Statins are first line therapy but add-on or alternative therapy may be required as per the algorithm

RIsk Assessment

Primary and Secondary Lipoprotein Determinants

LDL-C: Calculated from standard Lipid Profile
ApoB: Measeured separately



Non-HDL-C = Total Cholesterol-HDL-C

Atherogenic Apo B-containing Lipoproteins

RECOMMENDATION

- We recommend that non-HDL-C and apo B should continue to be considered alternate targets to LDL-C to evaluate risk in adults *(Strong Recommendation, High Quality Evidence)*.

Values and preferences - As clinicians are most familiar with LDL-C we continue to recommend its use as the primary target, but recognize the advantages of non-HDL-C or apo B.

Statin-indicated Conditions

CLINICAL ATHEROSCLEROSIS	ABDOMINAL AORTIC ANEURYSM	DIABETES MELLITUS	CHRONIC KIDNEY DISEASE	LDL-C ≥5.0 MMOL/L
Myocardial infarction, acute coronary syndromes Stable angina, documented coronary disease by angiography Stroke, TIA, documented carotid disease Peripheral artery disease, claudication and/or ABI <0.9	Abdominal aorta >3.0 cm or Previous aneurysm surgery	≥40 years of age or >15 years duration and age ≥30 years of age or Microvascular complications	>3 months duration and ACR >3.0 mg/mmol or eGFR <60 ml/min/1.73m2 ≥ 50 years of age	LDL-C ≥5.0 mmol/L or Document familial hypercholesterolemia Excluded 2nd causes

RECOMMENDATION

Statin indicated conditions:

- We recommend management that includes statin therapy in high risk conditions including clinical atherosclerosis, abdominal aortic aneurysm, most diabetes mellitus, chronic kidney disease (age >50 years) and those with LDL-C ≥5.0 mmol/L to lower the risk of CVD events and mortality *(Strong Recommendation, High Quality Evidence).*

When to Consider Pharmacological Treatment in Risk Management

Primary Prevention Conditions

Intermediate Risk	High Risk
FRS 10-19% and LDL-C ≥3.5 mmol/L **or** Non-HDL-C ≥4.3 mmol/L **or** Apo B ≥1.2 g/L **or** Men ≥50 and women ≥60 with one additional risk factor: low HDL-C, impaired fasting glucose, high waist circumference, smoker, hypertension	FRS ≥20% **or** alternative method

RECOMMENDATION

Primary prevention:

a) We recommend management that does not include statin therapy for individuals at low risk (modified FRS <10 %) to lower the risk of CVD events *(Strong Recommendation, High Quality Evidence)*.

b) We recommend management that includes statin therapy for individuals at high risk (modified FRS ≥20%) to lower the risk of CVD events *(Strong Recommendation, High Quality Evidence)*.

c) We recommend management that includes statin therapy for individuals at intermediate risk (modified FRS 10-19%) with LDL-C ≥3.5 mmol/L to lower the risk of CVD events. Statin therapy should also be considered for intermediate risk persons with LDL-C <3.5 mmol/L but with apo B ≥1.2 g/L or non-HDL-C ≥4.3 mmol/L or in men ≥50 and women ≥60 years of age with ≥1 CV risk factor *(Strong Recommendation, High Quality Evidence)*.

Values and preferences - This recommendation applies to individuals with an LDL-C ≥1.8 mmol/L. Any decision regarding pharmacological therapy for CV risk reduction in IR persons needs to include a thorough discussion of risks, benefits, and cost of treatment, alternative nonpharmacological methods for CV risk reduction and each individual's preference. The proportional risk reduction associated with statin therapy in RCTs in (IR) persons is of similar magnitude to that attained in high-risk persons. Moreover, irreversible severe side effects are very rare and availability of generic statins results in low cost of therapy. However, the absolute risk reduction is lower. Statin therapy may be considered in persons with FRS of 5%-9% with LDL-C ≥3.5 mmol/L or other CV risk factors as the proportional benefit from statin therapy will be similar in this group as well.

RECOMMENDATIONS

- We recommend treatment with a statin or statin/ezetimibe combination to reduce CVD events in adults ≥50 years with chronic kidney disease not treated with dialysis or a kidney transplant *(Strong Recommendation, High Quality Evidence)*.

Values and preferences - If the preference is to engage in early prevention and long term risk reduction, in subjects <50 years the absolute risk of events is lower but studies suggest that statins will result in a relative risk reduction similar to those ≥50 years. The statin/ezetimibe combination recommendation is based on the SHARP study which utilized 20 mg of simvastatin and 10 mg of ezetimibe.

- We suggest that lipid lowering therapy not be initiated in adults with dialysis dependent CKD *(Conditional Recommendation, Moderate Quality Evidence)*.

Values and preferences - In younger individuals who may become eligible for kidney transplantation or with a longer life expectancy, statin or statin/ezetemibe therapy may be desirable although high quality studies have not been done in this population.

- We suggest that lipid lowering therapy be continued in adults already on it at the time of dialysis initiation *(Conditional Recommendation, Low Quality Evidence)*.

Values and preferences - This recommendation reflects that fact that a substantial number of patients in SHARP transitioned to dialysis during the study and there was no heterogeneity of results for the population as a whole. The evidence is of low quality overall and there is substantial debate about best practice in this situation.

- We suggest the use of statin therapy in adults with kidney transplant *(Conditional Recommendation, Moderate Quality Evidence)*.

Pharmacological Treatment Indications and Targets

Category	Consider Initiating pharmaco-therapy if:	Target	NNT
Primary Prevention	**High** (FRS ≥20%)	LDL-C <2.0 mmol/L or >50% ↓ Or Apo B <0.8 g/L Or non-HDL-C <2.6 mmol/L	*35*
	Intermediate (FRS 10-19%) LDL-C ≥3.5 mmol/L or Non-HDL-C ≥4.3 mmol/L or Apo B ≥1.2 g/L or Men ≥50 and women ≥60 yrs and one additional CVD RF		*40*
Statin Indicated Conditions**	Clinical atherosclerosis*		*20*
	Abdominal aortic aneurysm		
	Diabetes mellitus ≥40 yrs 15 yrs duration for age ≥30 yrs (DM1) Microvascular disease		
	Chronic kidney disease (age ≥50 y) eGFR <60 mL/min/1.73 m2 or ACR > 3 mg/mmol		
	LDL-C ≥5.0 mmol/L	>50% ↓in LDL-C	

NNT: number needed to treat to prevent one CVD event for 5 years of treatment per 1 mmol/L reduction in LDL-C. NNT of <50 are generally regarded as desirable by physicians with some patients wishing to see NNT<30 to deem an intervention as acceptable.
FRS – modified Framingham Risk Score; ACR – albumin:creatinine ratio;
* consider LDL-C <1.8 mmol/L for subjects with ACS within last 3 months
** statins indicated as initial therapy

RECOMMENDATIONS

- We recommend a treat-to-target approach in the management of dyslipidemia to mitigate CVD risk *(Strong Recommendation, High Quality Evidence).*

Statin Indicated Conditions:

a) We recommend a target LDL-C consistently <2.0 mmol/L or >50% reduction of LDL-C for individuals for whom treatment is initiated to lower the risk of CVD events and mortality (Strong Recommendation, Moderate-Quality Evidence). Alternative target variables are apo B <0.8 g/L or non-HDL-C <2.6 mmol/L *(Strong Recommendation, Moderate Quality Evidence).*

b) 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 *(Strong Recommendation, Moderate Quality Evidence).*

Values and preferences - Based on the IMPROVE-IT trial, for those with a recent acute coronary syndrome and established coronary disease consideration should be given to more aggressive targets (LDL-C <1.8 mmol/L or >50% reduction). This might require the addition of ezetimibe (or other non-statin medications) to maximally tolerated statin. This would value more aggressive treatment in higher risk individuals.

Primary prevention conditions warranting therapy (All risk groups):

- 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 lower the risk of CVD events (Strong Recommendation, Moderate Quality Evidence). Alternative target variables are apo B <0.8 g/L or non-HDL-C <2.6 mmol/L *(Strong Recommendation, Moderate Quality Evidence).*

Values and preferences - From randomized trials in primary prevention, achieving these levels will reduce CVD events. The mortality reduction is statistically significant but modest (NNT =250). Treatment in primary prevention values morbidity reduction preferentially.

Potential Adverse Effects of Statins

RECOMMENDATIONS

- We recommend that despite concerns about a variety of possible adverse effects, all purported statin-associated symptoms should be evaluated systematically, incorporating observation during cessation, re-initiation (same or different statin, same or lower potency, same or decreased frequency of dosing) to identify a tolerated, statin-based therapy for chronic use *(Strong Recommendation, Low Quality Evidence)*.

- We recommend that vitamins, minerals, or supplements for symptoms of myalgia perceived to be statin-associated not be used *(Strong Recommendation, Low Quality Evidence)*.

Values and preferences - Always confirm that there is an indication for statin use which, if present, would suggest that benefits, clearly communicated to the patient, far outweigh the potential occurrence of any of the many side effects purported to be associated with statin use. Assess patient features that might limit dosage or preclude use of statins (eg potential drug-drug interactions) and always emphasize dietary, weight and exercise interventions to facilitate achievement of lipid goals and other benefits of comprehensive, CV prevention.

RECOMMENDATIONS

- We recommend ezetimibe as second-line therapy to lower LDL-C in patients with clinical cardiovascular disease if targets are not reached on maximally tolerated statin therapy *(Strong Recommendation, High Quality Evidence).*

- We recommend that niacin not be added to statin therapy for CVD prevention in patients who have achieved LDL-C targets *(Strong Recommendation, High Quality Evidence).*

Values and preferences - It remains unclear whether niacin offers CV benefits in other patient groups, such as those with LDL-C above target or those with low HDL-C or high TG.

- We recommend that fibrates not be added to statin therapy for CVD event prevention in patients who have achieved LDL-C targets*(Strong recommendation, High Quality Evidence).*

Values and preferences - In sub-group analysis, patients with elevated triglycerides and low HDL-C may benefit from fibrate therapy.

Non-Statin Therapy

RECOMMENDATIONS

- We suggest that bile acid sequestrants be considered for LDL-C lowering in high risk patients who remain above target despite statin +/- ezetimibe therapy *(Conditional Recommendation, Low Quality Evidence)*.
- We suggest the use of PCSK9 inhibitors (evolocumab, alirocumab) to lower LDL-C for patients with heterozygous familial hypercholesterolemia whose LDL-C remains above target despite maximally tolerated statin therapy (Conditional Recommendation, Moderate Quality Evidence). We suggest that evolocumab be added to background therapy in patients with homozygous familial hypercholesterolemia and continued if LDL-C lowering is documented *(Conditional Recommendation, Moderate Quality Evidence)*.
- We suggest that PCSK9 inhibitors be considered to lower LDL-C for patients with atherosclerotic cardiovascular disease in those not at LDL-C goal despite maximally tolerated statin +/- ezetimibe therapy *(Conditional Recommendation, Moderate Quality Evidence)*.

Values and preferences - Definitive outcome trials with PCSK9 inhibitors are underway but have not yet been completed. However, phase 3 efficacy trials show consistent reduction in LDL-C and reassuring trends towards reduced CV events, even though they were not powered for such. Given the very high lifetime risk faced by patients with FH or ASCVD, clinicians should balance the anticipated benefits of robust LDL- C lowering with PCSK9 inhibitors against the lack of definitive outcomes data.

- We suggest lomitapide and mipomersen* may be considered exclusively in patients with homozygous familial hypercholesterolemia *(Conditional Recommendation, Moderate Quality Evidence*).

**not approved in Canada*

Healthy Eating

- We recommend that all individuals are offered advice about healthy eating and activity and adopt the Mediterranean dietary pattern to lower their CVD risk *(Strong Recommendation, High Quality Evidence)*.

Values and preferences - Adherence is one of the most important determinants for attaining the benefits of any diet. Individuals should choose the dietary pattern that best fits with their values and preferences, allowing them to achieve the greatest adherence over the long term.

- We recommend that omega-3 polyunsaturated fatty acids supplements not be used to reduce CVD events *(Strong Recommendation, High Quality Evidence)*.

Values and preferences - Although there is no apparent cardiovascular benefit, patients may choose to use these supplements for other indications including the management of high triglycerides. Individuals should be aware that there are different preparations of long chain omega-3 PUFAs high in docosahexaenoic acid (DHA) and eicosapentaenoic (EPA) acid from marine, algal, and yeast sources and that high doses are required (2-4 g/day).

- We suggest that individuals avoid the intake of trans fats and decrease the intake of saturated fats for CVD disease risk reduction *(Conditional Recommendation, Moderate Quality Evidence)*.
- We suggest that to increase the probability of achieving a cardiovascular benefit, individuals should replace saturated fats with polyunsaturated fats *(Conditional Recommendation, Moderate Quality Evidence)*, emphasizing those from mixed omega-3/omega-6 polyunsaturated fatty acids (PUFAs) sources (e.g. canola and soybean oils) *(Conditional Recommendation, Moderate Quality Evidence)*, and target an intake of saturated fats of <9% of total energy *(Conditional Recommendation, Low Quality Evidence)*. If saturated fats are replaced with mono-unsaturated fatty acids (MUFAs) and carbohydrates, then people should choose plant sources of MUFAs (e.g. olive oil, canola oil, nuts, and seeds) and high-quality sources of carbohydrates (e.g. whole grains and low glycemic index carbohydrates) *(Conditional Recommendation, Low Quality Evidence)*.

CVD: cardiovascular disease.

Healthy Eating - Continued

Values and preferences - Industrial trans fats are no longer generally regarded as safe (GRAS) in the United States and there are monitoring efforts aimed at reducing them to the lowest level possible in Canada. These conditions make it increasingly difficult for individuals to consume trans fats in any appreciable amount. Individuals may choose to reduce or replace different food sources of saturated fats in the diet, recognizing that some food sources of saturated fats, such as milk and dairy products and plant-based sources of saturated fats, have not been reliably associated with harm.

- We suggest that all individuals be encouraged to moderate energy (caloric) intake to achieve and maintain a healthy body weight *(Conditional Recommendation, Moderate-Quality Evidence)* and adopt a healthy dietary pattern to lower their CVD risk:

(a) Mediterranean dietary pattern *(Strong Recommendation, High Quality Evidence)*
(b) Portfolio dietary pattern *(Conditional Recommendation, Moderate Quality Evidence)*
(c) DASH dietary pattern *(Conditional Recommendation, Moderate Quality Evidence)*
(d) Dietary patterns high in nuts (≥30 g/day) *(Conditional Recommendation, Moderate Quality Evidence)*
(e) Dietary patterns high in legumes (≥4 servings/week) *(Conditional Recommendation, Moderate Quality Evidence)*
(f) Dietary patterns high in olive oil (≥60 mL/day) *(Conditional Recommendation, Moderate Quality Evidence)*
(g) Dietary patterns rich in fruits and vegetables (≥5 servings/day) *(Conditional Recommendation, Moderate Quality Evidence)*
(h) Dietary patterns high in total fibre (≥30 g/day) (Conditional Recommendation, Moderate Quality Evidence) and whole grains (≥3 servings/day) *(Conditional Recommendation, Low-Quality Evidence)*
(i) Low-glycemic load (GL) *(Conditional Recommendation, Moderate Quality Evidence)* or low-glycemic index (GI) *(Conditional Recommendation, Low Quality Evidence)* dietary patterns
(j) Vegetarian dietary patterns *(Conditional Recommendation, Very Low Quality Evidence)*

Values and preferences - Adherence is one of the most important determinants for attaining the benefits of any diet. High food costs (e.g. fresh fruits and vegetables), allergies (e.g. peanut and tree nut allergies), intolerances (e.g. lactose intolerance), and gastrointestinal (GI) side effects (e.g. flatulence and bloating from fibre) may present as important barriers to adherence. Other barriers may include culinary (e.g. ability and time to prepare foods), cultural (e.g. culturally specific foods), and ecological/environmental (e.g. sustainability of diets) considerations. Individuals should choose the dietary pattern that best fits with their values and preferences, allowing them to achieve the greatest adherence over the long term.

CVD: cardiovascular disease.

Healthy Eating - Continued

• We suggest the following dietary patterns for LDL-C lowering:

(a) Dietary patterns high in dietary pulses (≥1 serving/day or ≥130 g/day) (beans, peas, chickpeas, and lentils) *(Conditional Recommendation, Moderate Quality Evidence)*
(b) Low-glycemic index (GI) dietary patterns *(Conditional Recommendation, Moderate Quality Evidence)*
(c) DASH dietary pattern *(Conditional Recommendation, Moderate Quality Evidence)*

• We recommend the following dietary components for LDL-C lowering:

(a) Portfolio dietary pattern *(Strong Recommendation, High Quality Evidence)*
(b) Dietary patterns high in nuts (≥30 g/day) *(Strong Recommendation, High Quality Evidence)*
(c) Dietary patterns high in soy protein (≥30 g/day) *(Strong Recommendation, High Quality Evidence)*
(d) Dietary patterns with plant sterols/stanols (≥2 g/day) *(Strong Recommendation, High Quality Evidence)*
(e) Dietary patterns high in viscous soluble fibre from oats, barley, psyllium, pectin, or konjac mannan (≥10 g/day) *(Strong Recommendation, High Quality Evidence)*
(f) NCEP Step I and II dietary patterns *(Strong Recommendation, High Quality Evidence)*

Values and preferences - Individuals may choose to use an LDL-C lowering dietary pattern alone or as an add-on to lipid-lowering therapy to achieve targets. Dietary patterns based on single-food interventions (high plant sterols/stanols, viscous soluble fibre, nuts, soy, dietary pulses) may be considered additive (that is, the ~5-10% LDL-C lowering effect of each food can be summed) based on the evidence from the Portfolio dietary pattern.

Treatment: Health Behaviour Interventions

Activity

- We recommend that adults should accumulate at least 150 minutes of moderate-to-vigorous intensity aerobic physical activity per week, in bouts of 10 minutes or more to reduce CVD risk *(Strong Recommendation, High Quality Evidence)*.

Smoking Cessation

- We recommend that adults who smoke should receive clinician advice to stop smoking to reduce CVD risk *(Strong Recommendation, High Quality Evidence)*.

Facilitators for Change

- We recommend combining low-risk lifestyle behaviors that include achieving and maintaining a healthy body weight, healthy diet, regular physical activity, moderate alcohol consumption, and moderate sleep duration to achieve maximal CVD risk reduction *(Strong Recommendation, High Quality Evidence)*.

Values and preferences - Low risk lifestyle behaviours are variably defined as follows: a healthy body weight (BMI 18.5-25 to <30kg/m^2 or WC of <88 cm in females or <95 to <102 cm in males), healthy diet (higher fruits & vegetables to Mediterranean dietary pattern), regular physical activity (≥1 time/week to 40 min/day plus 1 hour/week of intense exercise), smoking cessation (never smoked to smoking cessation >12 months), moderate alcohol consumption (≥12-14g/month to 46 g/day), and moderate sleep duration (6 to 8hours/night). Individuals can achieve benefits in a dose-dependent manner.

CVD: cardiovascular disease.

We recognize that lifestyle changes are not easy to achieve, but real effort should be exerted to realize the potential benefit of these non-pharmacological interventions.

WHO TO SCREEN

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

All patients with the following conditions regardless of age:

- Clinical evidence of atherosclerosis
- Abdominal aortic aneurysm
- Diabetes
- Arterial hypertension
- Current cigarette smoking
- Stigmata of dyslipidemia (arcus cornea, xanthelasma or xanthoma)
- Family history of premature CVD*
- Family history of dyslipidemia
- Chronic kidney disease
- Obesity (BMI ≥30 kg/m^2)
- Inflammatory disease
- HIV infection
- Erectile dysfuntion
- Chronic obstructive pulmonary disease
- Hypertensive diseases of pregnancy

HOW TO SCREEN

For all:

- History and physical examination
- Standard lipid panel (TC, LDL-C, HDL-C, TG)
- Non-HDL-C (will be calculated from profile)
- Glucose
- eGFR

Optional:

- ApoB
- Urine albumin:creatinine ratio (if eGFR <60 mL/min/1.73m^2, hypertension or diabetes)

NON-FASTING LIPID TESTING IS ACCEPTABLE

RISK ASSESSMENT, STRATIFICATION & TREATMENT CONSIDERATION

Calculate risk (unless statin-indicated condition) using the Framingham Risk Score (FRS)† or Cardiovascular Life Expectancy Model (CLEM)†

Repeat screening every 5 years for FRS <5% or every year for FRS ≥5%

No Pharmacotherapy

Low Risk

FRS <10%

Primary Prevention Conditions

Intermediate Risk

FRS 10-19%
and
LDL-C ≥3.5 mmol/L
or
Non-HDL-C ≥4.3 mmol/L
or
ApoB ≥1.2 g/L
or
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High Risk

FRS ≥20%
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alternative method

Statin-indicated Conditions‡

- **Clinical atherosclerosis**
- **Abdominal aortic aneurysm**
- **Most diabetes including:**
  - Age ≥40y
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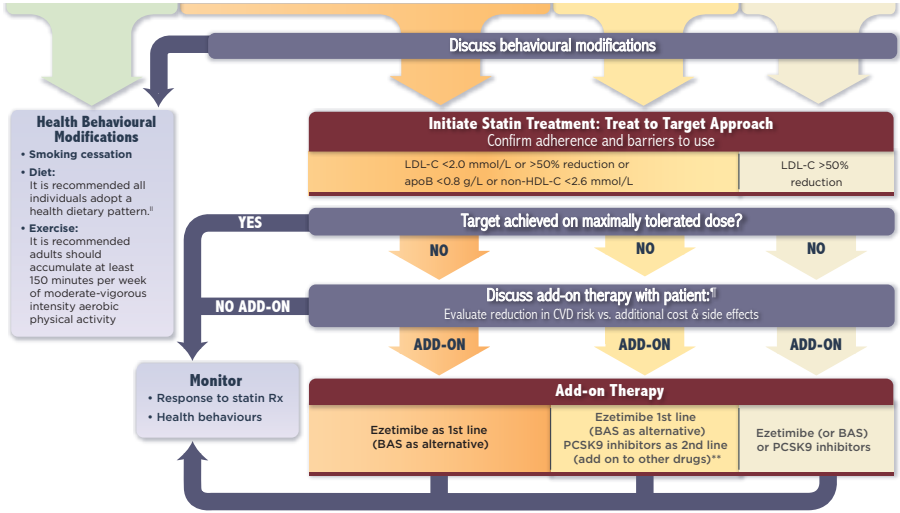
  - Microvascular disease
- **Chronic kidney disease**

LDL-C ≥5mmol/L
(genetic dyslipidemia)



*Men <55 and women <65 yrs of age in first degree relative.
†http://ccs.ca
‡Statins are first line therapy but add-on or alternative therapy may be required as per the algorithm.
[ii]Anderson et al. 2016 Update of the Canadian Cardiovascular Society guidelines for the management of dyslipidemia for the prevention of cardiovascular disease in the adult (publication pending).
¶Consider more aggressive targets for recent ACS patients.
**PCSK9 inhibitors have not been adequately studied as add-on to statins for patients with diabetes and other co-morbidities.
apoB: apolipoprotein B; BAS: bile acid sequestrants; BMI: body mass index; CVD: cardiovascular disease; HDL-C: high-density lipoprotein cholesterol; HIV:

Follow-up

- Most lipid lowering medications are well-tolerated
- Serum transaminases should be checked within first 3 months
- Creatine kinase can be checked if myalgias develop
- Routine testing of ALT or CK is not required thereafter

Referral May be Warranted in the Following Cases

- Unexplained atherosclerosis
- Severe dyslipidemias
- Genetic lipoprotein disorders
- Patients refractory to pharmacological treatment

ALT: alanine aminotransferase; CK: creatine kinase.

Update your Lipids iCCS app

iCCS replaces our individual guideline apps and contains the most up-to-date guideline information

Download the iCCS App today

For more information visit **CCS.CA/apps**

DYSLIPIDEMIA

Canadian Cardiovascular Society

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