Supplementary Material

2012 Update of the Canadian Cardiovascular Society Guidelines for the diagnosis and Treatment of Dyslipidemia for the Prevention of Cardiovascular Disease in the Adult

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Specific Dietary Considerations

Diets enriched with foods high in plant sterols (phytosterols), soy protein, high viscous fibres and nuts are associated with greater cholesterol lowering. Phytosterols lower LDL-C in a dose-dependent manner; a mean daily dose of ~2 g phytosterols reduced LDL-C by 8.8%.[1] Phytosterols had greater absolute LDL-C lowering effect in subjects with higher baseline LDL-C concentrations.[1] Studies have not yet demonstrated that phytosterols reduce CVD events. Diets enriched with 25 g of soy proteins, which contains isoflavones, have modest cholesterol-lowering effects, ranging between 3-5%. Daily consumption of 102 mg soy-derived isoflavones (equivalent to 500 ml of soy milk or 230 g of tofu), lowered LDL-C by a mean of 3.6%, with no effect on triglycerides and HDL-C.[2] Diets containing 10 g of psyllium, lowered LDL-C by 7% among individuals with hypercholesterolemia.[3] In general, daily consumption of 5-10 g viscous soluble fibres lowers LDL-C by ~5%. Nut consumption also improved lipid levels in a dose-related manner, particularly among subjects with higher LDL-C or with lower BMI.[103] Daily consumption of 67 g of nuts led to a mean reduction LDL-C by 7% and triglycerides by 10%.[4] A dietary portfolio consisting of the above groups of cholesterol-lowering foods achieved greater LDL-cholesterol reduction compared with low saturated fat dietary advice over a 6 month period (13.8% versus 3%).[5] The Mediterranean type diet, which is characterized by relatively high intake of mono- and poly-unsaturated fat, more fish intake, low consumption of red meat, and higher intake of fibre, vegetables and fruits, and nuts, has been shown to improve lipid profiles and reduce cardiovascular mortality.[6] A Dietary Approaches to Stop Hypertension (DASH)-like diet was associated with a significantly reduced risk of stroke (89%) and all-cause mortality (31%) in a prospective cohort study of adults with hypertension.[7] A recent updated Cochrane review suggested that reducing saturated fat by reducing or modifying dietary fat lowered the risk of CV events by 14% (RR 0.86, 95%CI 0.77-0.96).[8] The benefits were greater in people at high risk of CVD. However, there were no clear effects of dietary fat changes on total or CV mortality. Omega -3 polyunsaturated fatty acids in amounts of 2-4 grams /day (both EPA and DHA), under a physician's care, can lower triglycerides levels by 25-30% in patients with hypertriglyceridemia.[9] Moderate alcohol intake is acceptable (one drink per day for women and two drinks per day for men) if no metabolic or clinical contraindications are present including elevated triglyceride levels.

Supplemental Table S1 - Patients whose plasma lipid profile should be screened

Men ≥40 years of age, and women ≥50 years of age or postmenopausal (consider earlier in ethnic groups at increased risk such as South Asians or First Nations Individuals)

All patients with the following conditions, regardless of age

- Current cigarette smoking
- Diabetes
- Arterial hypertension
- Family history of premature CVD (< 55 years in men and < 65 years in women)
- Family history of hyperlipidemia
- Erectile dysfunction
- Moderate renal function impairment (eGFR ≤ 60 mL/min/1.73 m^2) or urinary albumin:creatinine ratio ≥ 3 mg/mmol (micro-albuminuria)
- Inflammatory disease (rheumatoid arthritis, systemic lupus erythematosus, psoriatic arthritis, ankylosing spondylitis, inflammatory bowel disease)
- HIV infection
- Chronic obstructive pulmonary disease
- Clinical evidence of atherosclerosis or abdominal aneurysm
- Clinical manifestation of hyperlipidemia (xanthomas, xanthelasmas, premature arcus cornealis)
- Obesity (metabolic syndrome, pre-diabetes, polycystic ovarian syndrome, body mass index > 27 kg/m^2)

Every 3-5 years or yearly for those with FRS >5 %

Supplemental Table S2. FRAMINGHAM RISK SCORE (FRS)

Estimation of 10-year Cardiovascular Disease (CVD) Risk

Step 1[1]

In the "points" column enter the appropriate value according to the patient's age, HDL-C, total cholesterol, systolic blood pressure and if they smoke or have diabetes. Calculate the total points.

Risk Factor		Risk Points				Points
		Men		Women		
Age						
30-34		0		0		
35-39		2		2		
40-44		5		4		
45-49		6		5		
50-54		8		7		
55-59		10		8		
60-64		11		9		
65-69		12		10		
70-74		14		11		
75+		15		12		
HDL-C (mmol/L)						
>1.6		-2		-2		
1.3-1.6		-1		-1		
1.2-1.3		0		0		
0.9-1.2		1		1		
<0.9		2		2		
Total Cholesterol						
<4.1		0		0		
4.1-5.2		1		1		
5.2-6.2		2		3		
6.2-7.2		3		4		
>7.2		4		5		
Systolic Blood Pressure (mmHg)		Not Treated	Treated	Not Treated	Treated	
<120		-2	0	-3	-1	
120-129		0	2	0	2	
130-139		1	3	1	3	
140-149		2	4	2	5	
150-159		2	4	4	6	
160+		3	5	5	7	
Diabetes	Yes	3		4		
	No	0		0		
Smoker	Yes	4		3		
	No	0		0		
Total Points						

[1] Adapted from: D'Agastino RB et al.(i). General cardiovascular risk profile for use in primary care. The Framingham Heart Study. Circ 2008;117:743-53.

Step 2

Using the total points from Step 1, determine the 10-year CVD risk (%).

Total Points	10-Year CVD Risk (%)	
	Men	Women
-3 or less	<1	<1
-2	1.1	<1
-1	1.4	1.0
0	1.6	1.2
1	1.9	1.5
2	2.3	1.7
3	2.8	2.0
4	3.3	2.4
5	3.9	2.8
6	4.7	3.3
7	5.6	3.9
8	6.7	4.5
9	7.9	5.3
10	9.4	6.3
11	11.2	7.3
12	13.3	8.6
13	15.6	10.0
14	18.4	11.7
15	21.6	13.7
16	25.3	15.9
17	29.4	18.51
18	>30	21.5
19	>30	24.8
20	>30	27.5
21+	>30	>30

Step 3

For subjects between 30 and 59 years - double cardiovascular disease risk percentage if cardiovascular disease is present in a first-degree relative before 55 years of age for men and 65 years of age for women.

Supplemental Table S3. Use of Secondary Testing for Risk Stratification

Should only be used if results will alter therapy-usually addition of pharmacotherapy.
Left to the discretion of the clinician in consultation with the patient. Type of testing reflects local availability and expertise. Cost and expected yield should be considered.
Multiple tests should not be routinely undertaken.
Annual or repeated assessment is not advocated.
Each of the tests outlined provides incremental predictive value to Framingham Risk Score in terms of risk stratification.
A “positive” test indicates that the calculated FRS may be erroneously low. Treatment should be considered.
With the exception of hsCRP, or eGFR the benefits of initiating statin therapy based on this approach has not yet been tested and thus has not yet been proven to improve CV outcomes.

Supplemental Table S4 – Optional biomarkers for Risk Stratification

Biomarker	Indications for testing	Frequency of testing	Normal Range
Lp(a) (mg/L)	• Further risk assessment particularly in individuals with a family history of premature CVD	• Genetically determined risk factor • Repeat testing not required	< 300 mg/L [a]
hsCRP (g/L)	• Men >50y and women >60y who are not candidates for statin Rx based on conventional risk factors	• q 3 y from age 50y (M) 60y (F) • If > 2.0 mg/L, repeat in 2-4 wk, use lower value for risk assessment	<1.0 lowest risk >2.0 increased risk[b] >3.0 high risk
A1C (%)	• Further risk assessment in selected subjects with FPG >5.6 mmol/L	• q 1 - 5 y • more frequently if weight gain or increased FBG	< 5.5% low risk 5.5-5.9 % mid risk 6.0-6.4 % high risk[c] >6.5 % diabetes
Urinary Albumin:Cr ratio ACR (mg/mmol)	• T2DM • poorly controlled HTN • Selected patients who are not candidates for statin Rx based on conventional risk factors	• q 1 y for patients with T2DM or poorly controlled HTN	<3.0 mg/mmol

[a] Lp(a) 300-700 mg/L confers~1.3X increased risk; > 800 mg/L ~1.5X increased CVD risk

[b] hsCRP > 2 mg/L is associated with ~1.5 to 2.0 X increased CVD risk

[c] HbA1c 6.0 – 6.5% is associated with ~1.5 – 1.8X increased CVD risk

Supplemental Table S5- Optional non-invasive testing for Risk Stratification

Noninvasive test	Indications for testing	Normal Range	Frequency of testing
Graded exercise stress test	Selected asymptomatic adults with CVD risk factors especially those who are embarking on a vigorous exercise program Selected adults in the intermediate risk category	Duke Score[a] Low risk ≥ +5 Moderate risk -10 to +4 High risk ≤ -11	If symptoms develop
Carotid imaging	Selected asymptomatic adults not candidates for statin Rx based on conventional risk factors. Only in centres with clear expertise	Carotid intima-media thickness (CIMT) <1.0 mm No visible plaque[b]	q 5-10 y as indicated for reassessment of risk
ABI	Selected asymptomatic adults, not candidates for statin Rx based on conventional risk factors (particularly smokers, diabetes)	Ankle-brachial index (ABI) 1.0-1.3[c]	q 5-10 y as indicated for reassessment of risk or if symptoms develop
CAC	Selected asymptomatic adults who are not candidates for statin Rx based on conventional risk factors	CAC Low risk 0 Increased risk 0 – 99 High risk 100-299[d] Very high risk > 300[e]	CAC = 0 q 10y where clinically indicated CAC = 0 – 100 q 3-5y if Rx is deferred

[a] CAD risk is also increased in subjects with low exercise capacity (<6 METS achieved on GXT)
[b] Each 0.1 mm increase in CIMT is associated with a 10% increased risk for MI and a 13% increased risk for stroke. Visible arterial wall plaques defined as a CIMT $\geq$1.5 mm or in the absence of plaque, CIMT values >75% for age and sex are considered as evidence of subclinical atherosclerosis. A CIMT $\geq$1.5 mm is an indication for statin therapy
[c] An ABI<0.90 is associated with at least a 50% stenosis in a peripheral artery and a high probability of concomitant coronary artery disease and is an indication for intensive statin therapy.
[d] CAC>100 is generally considered high risk
[e] CAC>300 places patient in very high risk category (10 y risk of MI/CV death = 28%)

Supplemental Table S6- Definition of Cardiovascular Risk

Risk	Framingham Risk Score (corrected for Family Hx)	Other conditions for consideration of therapy
Low	0-9%	
Intermediate	10-19%	
High	≥ 20%	Clinical coronary, cerebrovascular or peripheral vascular disease, abdominal aortic aneurysm *Diabetes and age ≥ 40yrs or 15 yr duration and ≥ 30yrs or microvascular complications Chronic kidney disease GFR ≤ 45 or ACR ≥ 30 or GFR ≤ 60 and ACR ≥ 3 High risk hypertension – hypertension + 3 risk factors[22]

ACR – urine albumin:creatinine ratio – mg/mmol; GFR – glomerular filtration rate – ml/min/1.73 m^2 ;
***** Many subjects with DM do not have high 10 year risk, but therapy is warranted based on high lifetime risk

Supplemental Table S7 – Summary of Treatment Target Guidelines

Risk Level	Initiate therapy if	Primary Target LDL-C	Alternate Target
High FRS ≥ 20%	Consider treatment in all (Strong, High)	≤ 2 mmol/L or ≥50% decrease in LDL-C (Strong, High)	Apo B ≤ 0.8 g/L Non HDL-C ≤ 2.6 mmol/L (Strong, High)
Intermediate FRS 10-19%	LDL-C ≥ 3.5 mmol/L (Strong, Moderate) For LDL-C < 3.5 consider if: Apo B ≥ 1.2 g/L or Non-HDL-C ≥ 4.3 mmol/L (Strong,Moderate)	≤ 2 mmol/L or ≥50% decrease in LDL-C (Strong, Moderate)	Apo B ≤ 0.8 mg/L Non HDL-C ≤ 2.6 mmol/L (Strong,Moderate)
Low * FRS <10%	LDL-C ≥ 5.0 mmol/L Familial hypercholesterolemia (Strong, Moderate)	≥50% reduction in LDL-C (Strong, Moderate)	

* for those in the 5-9% group, consider yearly calculation of FRS and discussion about risk-benefit ratio of pharmacotherapy at lower levels of LDL-C
The above recommendations are to be considered in the background of optimal health behaviours (as outlined in the document).

Supplemental Table S8 – Expected Benefit of Health Behaviour Changes

Intervention (minimal dose for effect)	**Expected Outcome**
Dietary cholesterol intake[10] < 300 mg/day (NCEP step I diet) < 200 mg/day (NCEP step II diet)	↓ LDL-C 10-12% 12-16%
Saturated fats <7% of daily caloric intake[8]	↓ LDL-C 5-10%; ↓ CVD mortality 14%
Phytosterols 1-2 gm/day[1]	↓ LDL-C 5-8%
Soy proteins with isoflavones 25g/day[2]	↓ LDL-C 3-5%
Viscous fibre 10 g/day[3]	↓ LDL-C 3-5%
Nuts 30-67g /day[4]	↓ LDL-C 5-7%, ↓ TG 5-10%
Portfolio type diet[5]	↓ LDL-C 8-14%
Mediterranean type diet[6]	↓ LDL-C 5-10%; ↓ CVD mortality
DASH (Dietary Approaches to Stop Hypertension) diet[7]	↓ CVD mortality in those with hypertension
Moderated Alcohol intake 1-2 drinks/day	↑ HDL 5-10%, ↓ CVD events
Weight loss and reduction of abdominal obesity[11] 5-10% of body weight loss	↓ LDL-C, ↑ HDL, ↓ TG, ↓cardiometabolic risk
Omega -3 - 2-4 g of eicosapentaenoic acid (EPA) plus docosahexaenoic acid (DHA)/day	↓ TG 25-30% in those with ↑ TG
Exercise[12,13] 30-60 min/day moderate to vigourous intensity	↑ HDL 5-10%, ↓ CVD events
Smoking cessation	↑ HDL, ↓ CVD events

Supplemental Table S9: Comparison of Clinical Utilities of LDL C, Non-HDL C and apoB

		LDL- C	Non-HDL C	ApoB
Laboratory	Accuracy & Precision	+ (Calculated)	++	+++
	Fasting Necessary	Yes	No	No
Assess Risk in Non-Treated Patients		+	++	+++
Assess Risk in Treated Patients		+	+	+
Assess Adequacy of Statin Dose		+	+	++
Diagnosis of Lipid Disorders		+	+	+++
Availability		+++	+++	+

Supplemental Figure S1 – Cardiovascular Age

Cardiovascular Age Tables

Male

Diabetes: NO

Non-Smokers

Blood Pressure (mmHg)	Total Cholesterol:HDL Ratio 3	4	5	6	7	Age
120/80	28.1	28.4	28.9	29.5	30.2	
130/85	29.1	29.4	30.0	30.8	31.5	
140/90	30.0	30.4	31.2	32.0	32.9	30
150/95	31.0	31.4	32.3	33.2	34.2	
120/80	37.3	37.6	38.1	38.8	39.5	
130/85	38.2	38.6	39.2	40.0	40.8	
140/90	39.2	39.6	40.3	41.2	42.1	40
150/95	40.1	40.6	41.5	42.4	43.4	
120/80	47.1	47.3	47.9	48.5	49.2	
130/85	47.9	48.3	48.9	49.6	50.4	
140/90	48.8	49.2	50.0	50.8	51.7	50
150/95	49.7	50.2	51.0	51.9	52.9	
120/80	57.4	57.6	58.1	58.6	59.2	
130/85	58.2	58.5	59.0	59.6	60.3	
140/90	59.0	59.3	60.0	60.6	61.4	60
150/95	59.8	60.2	60.9	61.6	62.4	
120/80	68.2	68.4	68.7	69.1	69.5	
130/85	68.8	69.0	69.4	69.9	70.3	
140/90	69.5	69.7	70.1	70.6	71.1	70
150/95	70.1	70.4	70.8	71.3	71.8	

Smokers

Blood Pressure (mmHg)	Total Cholesterol:HDL Ratio 3	4	5	6	7	Age
120/80	33.1	33.7	34.7	35.7	36.8	
130/85	34.2	34.9	36.0	37.1	38.3	
140/90	35.3	36.0	37.3	38.5	39.7	30
150/95	36.4	37.2	38.5	39.8	41.1	
120/80	42.2	42.8	43.8	44.8	45.9	
130/85	43.3	43.9	45.1	46.2	47.3	
140/90	44.3	45.1	46.3	47.5	48.7	40
150/95	45.4	46.2	47.5	48.8	50.0	
120/80	51.7	52.3	53.2	54.2	55.1	
130/85	52.7	53.3	54.4	55.4	56.4	
140/90	53.7	54.4	55.5	56.6	57.6	50
150/95	54.6	55.4	56.6	57.7	58.7	
120/80	61.5	62.0	62.7	63.5	64.3	
130/85	62.4	62.9	63.7	64.5	65.3	
140/90	63.2	63.8	64.6	65.4	66.2	60
150/95	64.0	64.6	65.5	66.2	66.9	
120/80	71.4	71.7	72.2	72.7	73.2	
130/85	72.1	72.4	72.9	73.4	73.9	
140/90	72.7	73.0	73.6	74.0	74.4	70
150/95	73.3	73.6	74.1	74.5	74.9	

Diabetes: YES

Non-Smokers

Blood Pressure (mmHg)	Total Cholesterol:HDL Ratio 3	4	5	6	7	Age
120/80	33.3	33.7	34.3	35.0	35.8	
130/85	34.3	34.7	35.4	36.2	37.1	
140/90	35.3	35.7	36.6	37.5	38.4	30
150/95	36.2	36.8	37.7	38.7	39.7	
120/80	42.3	42.7	43.3	44.1	44.8	
130/85	43.3	43.7	44.4	45.3	46.1	
140/90	44.2	44.7	45.5	46.4	47.4	40
150/95	45.1	45.7	46.6	47.6	48.6	
120/80	51.8	52.2	52.8	53.4	54.1	
130/85	52.7	53.1	53.8	54.5	55.3	
140/90	53.5	54.0	54.8	55.6	56.4	50
150/95	54.4	54.9	55.8	56.6	57.5	
120/80	61.6	61.9	62.4	62.9	63.5	
130/85	62.4	62.7	63.3	63.8	64.4	
140/90	63.1	63.5	64.1	64.7	65.4	60
150/95	63.8	64.2	64.9	65.6	66.2	
120/80	71.6	71.8	72.1	72.4	72.8	
130/85	72.1	72.4	72.7	73.1	73.5	
140/90	72.7	72.9	73.3	73.7	74.1	70
150/95	73.2	73.5	73.9	74.3	74.7	

Smokers

Blood Pressure (mmHg)	Total Cholesterol:HDL Ratio 3	4	5	6	7	Age
120/80	38.4	39.1	40.1	41.1	42.1	
130/85	39.5	40.2	41.3	42.4	43.4	
140/90	40.6	41.3	42.5	43.6	44.7	30
150/95	41.6	42.4	43.6	44.8	45.9	
120/80	47.3	47.9	48.9	49.9	50.8	
130/85	48.3	49.0	50.1	51.1	52.0	
140/90	49.3	50.0	51.1	52.2	53.1	40
150/95	50.3	51.0	52.1	53.2	54.2	
120/80	56.3	56.9	57.8	58.6	59.4	
130/85	57.3	57.9	58.8	59.6	60.3	
140/90	58.2	58.8	59.7	60.5	61.3	50
150/95	59.0	59.6	60.5	61.4	62.2	
120/80	65.4	65.9	66.5	67.1	67.6	
130/85	66.2	66.6	67.2	67.8	68.3	
140/90	66.9	67.3	67.9	68.5	69.0	60
150/95	67.5	67.9	68.5	69.1	69.6	
120/80	74.4	74.6	75.0	75.3	75.6	
130/85	74.9	75.1	75.5	75.8	76.1	
140/90	75.3	75.5	75.9	76.2	76.5	70
150/95	75.7	76.0	76.3	76.6	76.9	

Female

Diabetes: NO

Blood Pressure (mmHg)	Non-Smokers: Total Cholesterol:HDL Ratio 3	4	5	6	7	Age	Smokers: Total Cholesterol:HDL Ratio 3	4	5	6	7	Blood Pressure (mmHg)
120/80	28.8	29	29.2	29.5	29.9		32.6	33.1	33.7	34.4	35.2	120/80
130/85	29.5	29.7	30.0	30.4	30.8	Age	33.4	34.0	34.7	35.6	36.6	130/85
140/90	30.2	30.5	30.8	31.3	31.8	30	34.2	34.9	35.8	36.9	38.0	140/90
150/95	30.9	31.2	31.7	32.2	32.8		35.0	35.9	36.9	38.1	39.4	150/95
120/80	38.1	38.2	38.5	38.8	39.1		41.8	42.2	42.9	43.6	44.4	120/80
130/85	38.7	39	39.2	39.6	40.1	Age	42.5	43.1	43.9	44.8	45.8	130/85
140/90	39.4	39.7	40.0	40.5	41.1	40	43.3	44.0	45.0	46.0	47.1	140/90
150/95	40.1	40.4	40.9	41.4	42.1		44.1	45.0	46.1	47.3	48.5	150/95
120/80	47.6	47.8	48	48.3	48.6		51.2	51.6	52.2	52.8	53.6	120/80
130/85	48.3	48.5	48.8	49.1	49.5	Age	51.9	52.4	53.1	53.9	54.8	130/85
140/90	48.9	49.2	49.5	50.0	50.5	50	52.6	53.3	54.1	55.0	56.0	140/90
150/95	49.6	49.9	50.3	50.8	51.4		53.4	54.1	55.1	56.1	57.2	150/95
120/80	57.6	57.7	57.9	58.1	58.4		60.8	61.1	61.5	62.0	62.6	120/80
130/85	58.2	58.3	58.5	58.8	59.2	Age	61.4	61.8	62.3	62.9	63.6	130/85
140/90	58.8	58.9	59.2	59.6	60.0	60	62.0	62.5	63.1	63.8	64.5	140/90
150/95	59.3	59.6	59.9	60.3	60.8		62.7	63.3	63.9	64.7	65.5	150/95
120/80	67.9	67.9	68.1	68.2	68.4		70.5	70.7	71.0	71.3	71.6	120/80
130/85	68.4	68.5	68.6	68.8	69.0	Age	71.0	71.3	71.6	72.0	72.3	130/85
140/90	68.9	69.0	69.2	69.4	69.6	70	71.5	71.8	72.2	72.6	73.0	140/90
150/95	69.4	69.5	69.7	70.0	70.3		72.1	72.4	72.8	73.2	73.7	150/95

Diabetes: YES

Blood Pressure (mmHg)	Non-Smokers: Total Cholesterol:HDL Ratio 3	4	5	6	7	Age	Smokers: Total Cholesterol:HDL Ratio 3	4	5	6	7	Blood Pressure (mmHg)
120/80	38.2	38.7	39.2	39.9	40.6		42.5	43.5	44.8	46.1	47.4	120/80
130/85	39.0	39.5	40.2	41.0	41.9	Age	43.5	44.7	46.1	47.6	49.1	130/85
140/90	39.8	40.4	41.2	42.2	43.2	30	44.5	45.9	47.5	49.1	50.7	140/90
150/95	40.6	41.3	42.3	43.4	44.5		45.5	47.1	48.8	50.5	52.0	150/95
120/80	47.2	47.6	48.2	48.9	49.6		51.3	52.4	53.6	54.8	56.2	120/80
130/85	47.9	48.5	49.2	50.0	50.9	Age	52.3	53.5	54.9	56.3	57.7	130/85
140/90	48.7	49.4	50.2	51.1	52.1	40	53.2	54.6	56.2	57.7	59.3	140/90
150/95	49.5	50.2	51.2	52.3	53.4		54.2	55.8	57.5	59.1	60.5	150/95
120/80	56.3	56.7	57.2	57.8	58.4		60.0	60.9	61.9	62.9	64.0	120/80
130/85	57.0	57.4	58.1	58.8	59.5	Age	60.8	61.9	63.0	64.1	65.3	130/85
140/90	57.6	58.2	59.0	59.8	60.7	50	61.7	62.8	64.1	65.3	66.5	140/90
150/95	58.4	59.0	59.9	60.8	61.8		62.5	63.8	65.1	66.4	67.5	150/95
120/80	65.3	65.6	66.0	66.4	66.9		68.4	69.0	69.6	70.3	71.0	120/80
130/85	65.9	66.2	66.7	67.2	67.8	Age	69.0	69.7	70.4	71.1	71.8	130/85
140/90	66.5	66.9	67.4	68.0	68.6	60	69.7	70.4	71.2	71.9	72.6	140/90
150/95	67.1	67.6	68.1	68.8	69.4		70.3	71.1	71.9	72.6	73.3	150/95
120/80	74.3	74.4	74.6	74.9	75.2		76.5	76.8	77.1	77.5	77.8	120/80
130/85	74.7	74.9	75.2	75.4	75.7	Age	76.9	77.3	77.6	78.0	78.3	130/85
140/90	75.1	75.4	75.7	76.0	76.3	70	77.4	77.7	78.1	78.4	78.7	140/90
150/95	75.6	75.8	76.1	76.5	76.8		77.8	78.1	78.5	78.8	79.1	150/95

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Canadian Cholesterol Guidelines 2012
Summary of recommendations

A. Screening Fasting lipid profile

- Screen men ≥40 y, women ≥50y or post-menopausal

Screen at any age adults with:

- Diabetes, hypertension, cigarette smoking, Family Hx
- Obesity (BMI > 27 kg/m^2)
- Clinical signs of hyperlipidemia
- Evidence of atherosclerosis or AAA
- Rheumatoid arthritis, SLE, psoriatic arthritis, Ankylosing Spondylitis, IBD
- HIV
- e-GFR <60 mL/min/1.73 m^2 or ACR > 3 mg/mmol
- COPD

B. Cardiovascular Risk Assessment

Determine risk using Framingham Risk Score modified for family history (double the CVD risk percentage if any CVD present in a first degree relative – men < 55 and women < 65 years). See Framingham risk score tables or (www.circl.ubc.ca/cardiorisk-calculator.html)

Consider calculation of cardiovascular age – particularly in younger subjects where 10 year FRS may underestimate long-term risk, and to improve compliance with medical treatment of dyslipidemia and hypertension. (See tables in appendix or www. chiprehab.com)

C. Targets of therapy

	Risk Level	
		Primary: LDL-C
High **Or** **Treatment Indicated**	CAD, PVD, or cerebrovascular disease,abdominal aneurysm or modified FRS ≥ 20%, *DM ≥ 40 years age or 15 years duration and age ≥ 30yrs, or with microvascular disease, or High risk Hypertension or CKD	≤2 mmol/L or ≥50% ↓ LDL-C **Alternate Target** ApoB ≤ 0.80g/L or non-HDL-C ≤ 2.6 mmol/L
Inter	Modified FRS 10-19% LDL-C ≥3.5 mmol/L or For LDL < 3.5 consider if: Apo B ≥ 1.2 g/L or Non-HDL-C ≥ 4.3 mmol/L	≤2 mmol/L** or ≥50% ↓ LDL-C **Alternate Target** ApoB ≤ 0.80g/L or non-HDL-C ≤ 2.6 mmol/L
Low	Modified FRS <10% ≥5.0 mmol/L	≥50% ↓ LDL-C

Non-HDL-C = Total Cholesterol – HDL-C

**Many subjects with DM do not have high 10 year risk, but therapy is warranted based on high lifetime risk*

***Meta-analysis of statin trials show that for each 1.0 mmol/L decrease in LDL-C, there is a corresponding 20-25%.relative risk reduction.*

Consider use of Apo B or non-HDL-C when TG > 1.5 mM/L

Those whose 10 year risk for CVD is 5 - 9% have been shown in RCTs to achieve the same relative risk reduction from statin therapy as those at higher 10yr but the absolute benefit of therapy is estimated to be smaller.

D. Secondary testing

May be considered to aid Rx decision for those in intermediate risk (or upper end of low risk) not already candidates for statins. Based on local expertise.

- Biomarkers – Lp(a), hs-CRP, HbA1c, ACR
- Imaging – Exercise stress test, ABI, carotid IMT, coronary calcium score

Approaches using these tests for risk stratification have not been prospectively validated except for hs-CRP or eGFR.

E. Treatment Health Behaviours

- Smoking cessation
- Diet (reduced saturated fats and refined sugars)
- Weight reduction and maintenance
- Exercise 150 min/week

F. Medication

In high-risk patients, pharmacological therapy should be considered concomitantly with lifestyle changes. In moderate-risk, lifestyle changes should be implemented first followed by medications if the targets not reached. Statins are first line therapy.

- > 45% ↓ LDL-C – rosuvastatin, atorvastatin
- 30-45% ↓ LDL-C – simvastatin, lovastatin
- < 30% ↓ LDL-C – pravastatin, fluvastatin

Alternative or combination therapy.

- Ezetimibe (Ezetrol)
- Cholestyramine, colestipol, colesevelam (Lodalis)
- Nicotinic acid, IR niacin (Niaspan)
- Fenofibrate (Lipidil), bezafibrate, gemfibrozil*

Combination therapy has not been shown to reduce CVD events compared with statins alone. Ezetimibe and simvastatin ↓ CVD events compared with placebo in CKD patients.

*Gemfibrozil should not be combined with statins.

G. **Statin intolerance**

Statin associated intolerance should be approached systematically. We do not recommend supplements to treat statin associated myalgas. Approaches include:

- Ensure phenotype warrants pharmacotherapy
- Retesting at lower dose or change to alternate statin
- Low dose combination therapy
- Intermittent (alternate day) statin
- Alternate lipid lowering agent

H. 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.

I. Referral to Specialized Clinics

Most Canadian universities have a specialized lipid clinic. Cases of unexplained atherosclerosis, severe dyslipidemias, genetic lipoprotein disorders and patients refractory to pharmacological treatment should be referred.

FRAMINGHAM RISK SCORE (FRS)

Estimation of 10-year Cardiovascular Disease (CVD) Risk

Step 1[1]

In the "points" column enter the appropriate value according to the patient's age, HDL-C, total cholesterol, systolic blood pressure and if they smoke or have diabetes. Calculate the total points.

Risk Factor		Risk Points				Points
		Men		Women		
Age						
30-34		0		0		
35-39		2		2		
40-44		5		4		
45-49		6		5		
50-54		8		7		
55-59		10		8		
60-64		11		9		
65-69		12		10		
70-74		14		11		
75+		15		12		
HDL-C (mmol/L)						
>1.6		-2		-2		
1.3-1.6		-1		-1		
1.2-1.3		0		0		
0.9-1.2		1		1		
<0.9		2		2		
Total Cholesterol						
<4.1		0		0		
4.1-5.2		1		1		
5.2-6.2		2		3		
6.2-7.2		3		4		
>7.2		4		5		
Systolic Blood Pressure (mmHg)		Not Treated	Treated	Not Treated	Treated	
<120		-2	0	-3	-1	
120-129		0	2	0	2	
130-139		1	3	1	3	
140-149		2	4	2	5	
150-159		2	4	4	6	
160+		3	5	5	7	
Diabetes	Yes	3		4		
	No	0		0		
Smoker	Yes	4		3		
	No	0		0		
Total Points						

[1] Adapted from: D'Agastino RB et al.(i). General cardiovascular risk profile for use in primary care. The Framingham Heart Study. Circ 2008;117:743-53.

Step 2

Using the total points from Step 1, determine the 10-year CVD risk (%).

Total Points	10-Year CVD Risk (%)	
	Men	Women
-3 or less	<1	<1
-2	1.1	<1
-1	1.4	1.0
0	1.6	1.2
1	1.9	1.5
2	2.3	1.7
3	2.8	2.0
4	3.3	2.4
5	3.9	2.8
6	4.7	3.3
7	5.6	3.9
8	6.7	4.5
9	7.9	5.3
10	9.4	6.3
11	11.2	7.3
12	13.3	8.6
13	15.6	10.0
14	18.4	11.7
15	21.6	13.7
16	25.3	15.9
17	29.4	18.51
18	>30	21.5
19	>30	24.8
20	>30	27.5
21+	>30	>30

Step 3

For subjects between 30 and 59 years - double cardiovascular disease risk percentage if cardiovascular disease is present in a first-degree relative before 55 years of age for men and 65 years of age for women.

Anderson, Grégoire et al.

STEP 1
Who to Screen (Every 3-5 yrs, except Every yr for adjusted FRS 5-10%)

Men ≥40 years of age, and women ≥50 years of age or postmenopausal
All patients with the following conditions, regardless of age:
Clinical evidence of atherosclerosis or abdominal aneurysm

Current smoking	Diabetes mellitus	Hypertension	Family Hx premature CAD
Erectile dysfunction	Chronic Kidney Dz	Inflammatory Dz	Family Hx Dyslipidemia
HIV	COPD	Obesity	At risk ancestry

STEP 2
How to screen

For all: History and examination, LDL, HDL, TG, glucose, eGFR
Optional: apoB (instead of LDL, and HDL), urine albumin:creatinine ratio (if eGFR < 60, hypertension, diabetes)

a) High Risk Features

STEP 3
Risk Assessment

Any Clinical Vascular Disease; AAA; eGFR ≤ 45 ml/min/1.73 m^2; ACR ≥30 mmol/mg; eGFR ≤ 60 ml/min/1.73 m^2 and ACR >3 mmol/mg; Diabetes – age >40 yrs or duration > 15 years+age >30 or microvascular disease; High risk hypertension → **Yes**

b) Framingham Risk Score (FRS % x 2 for premature FH of CAD)

Low Risk (0-9%)

Initiate therapy	Primary target LDL
LDL-C ≥ 5.0 mmol/L Or Familial Hypercholesterolemia	50% ↓ LDL-C

Intermediate Risk (10-19%)

Initiate therapy	Primary target LDL-C	Alternate Target
LDL C ≥ 3.5 mmol/L	≤ 2.0 mmol/L or 50% ↓ LDL-C	Apo B ≤ 0.8 g/L or Non-HDL-C ≤ 2.6

High Risk (≥20%)

Initiate therapy	Primary target LDL-C	Alternate Target
Consider therapy In all	≤ 2.0 mmol/L or 50% ↓ LDL-C	Apo B ≤ 0.8 g/L or Non-HDL-C ≤ 2.6

STEP 4 - Optional Approaches in those not Already Treated – For those in the higher end of Low Risk (5-9%) and those in Intermediate Risk (10-19%), statin therapy will reduce relative risk. The absolute benefit is related to risk (ie greater benefit for those at higher risk). Options include: a) Risk-benefit ratio discussion with patient about statin therapy; b) Assessment of cardiovascular age for those who appear to be at higher long term risk (but lower 10 year risk by FRS); c) Use of alternate targets or consider secondary testing (based on local practice) to guide decision about pharmacotherapy

< 5 %	5-9%
Re-evaluate risk q 3-5 yrs Secondary testing not indicated	Re-evaluate risk yearly Consider selected use of secondary testing

Intermediate Risk - Initiate therapy
Consider if apo B ≥ 1.2 g/L or Non-HDL-C ≥ 4.3 mmol/L
Consider selected use of secondary testing
a)if not already treated based on above; b) positive secondary test may prompt treatment or closer follow-up

High Risk - Secondary testing is not indicated in High Risk patients as they warrant therapy regardless

STEP 5 - Implement Health Behaviours

Health behaviour modification is the cornerstone of risk reduction and should be recommended in all and particularly for those who reach threshold for pharmacotherapy

STEP 6 – Pharmacotherapy

Statins are first line therapy if LDL-C (or alternate targets) is above target based on risk assessment. A 20% relative risk reduction expected for each 1 mmol/L ↓ LDL-C

STEP 7 – Achieving Target Levels, Adverse Effects and Compliance – consider using Cardiovascular Age to improve compliance

Goal achieved and no side effects Check LDL-C (or Alternate) yearly	Goal not achieved on maximum statin dose Consider addition of non-statin agent if High Risk	Side effects – Systematic approach to evaluation; lower dose or intermittent statin; combination or alternate therapy