Hyperlipidemia or Dyslipidemia

**Diagnosis/Condition:**
- Hypercholesterolemia, pure
- Hyperlipidemia, mixed
- Hypertriglyceridemia
- Disorder of lipid metabolism, unspecified

**Discipline:** Integrated

**ICD-9 Codes:** 272.0, 272.1, 272.2, 272.9

**ICD-10 Codes:** E78.0, E78.1, E78.2, E78.9

**Origination Date:** 2010

**Review/Revised Date:** 07/2014

**Next Review Date:** 07/2016

Hyperlipidemia (elevated or high cholesterol or triglycerides or both) is defined as the increased levels of lipids (fats) in the blood, including cholesterol and triglycerides. This condition can significantly increase the risk of coronary artery disease (CAD) or atherosclerosis. Complementary and alternative medicine providers encounter patients with these risk factors which are a priority public health issue. These encounters are an important opportunity to promote evidence-based health promotion and chronic disease prevention strategies.

The chart below summarizes lipid levels according to low-very high values for screening. Anything above optimal/desirable should be treated appropriately to reduce cardiovascular risks. Note: High HDL is considered a negative risk factor (removes a risk factor).

<table>
<thead>
<tr>
<th>Lipid Type</th>
<th>Low mg/dL (mmol/L)</th>
<th>Optimal/Desirable mg/dL (mmol/L)</th>
<th>Borderline high mg/dL (mmol/L)</th>
<th>High mg/dL (mmol/L)</th>
<th>Very high mg/dL (mmol/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Cholesterol (TC)</td>
<td>N/A</td>
<td>Less than 200 (5.17)</td>
<td>200 to 239 (5.17 to 6.18)</td>
<td>≥ 240 (6.20)</td>
<td>N/A</td>
</tr>
<tr>
<td>Low-density lipoprotein (LDL)</td>
<td>N/A</td>
<td>Less than 100-129 (2.58 to 3.33)/ If has CHD and risk factors - 70 to 80 (1.81 to 2.07)</td>
<td>130 - 159 (3.36 to 4.11)</td>
<td>160 to 189 (4.13 to 4.88)</td>
<td>≥ 190 (4.91)</td>
</tr>
<tr>
<td>High-density lipoprotein (HDL)</td>
<td>&lt;40 (1.03)</td>
<td>40 to 60 (1.03 to 1.55)</td>
<td>N/A</td>
<td>N/A</td>
<td>≥ 60 or 1.55</td>
</tr>
<tr>
<td>Triglycerides</td>
<td>Less than 150 (1.69)</td>
<td>150 to 199 (1.69 to 2.25)</td>
<td>200 to 499 mg/dL (2.25 to 5.63)</td>
<td>&gt; 500 (5.65)</td>
<td></td>
</tr>
</tbody>
</table>
Total-to-HDL-cholesterol ratio is of greater predictive value than the serum total or LDL-C and should be used to guide treatment options.³

The United States Preventive Services Task Force recommends the following in regards to lipid screening:

- It should start at age 35 in men and age 45 in women. Those at risk for CAD should be treated based upon the results of their screening test.
- Recommended at a younger age (age 20-35 in men and 20-45 in women) for people with CAD risk factors. These include people with diabetes, a family history of heart disease in male relatives before age 50 or in female relatives before age 60, a family history of hyperlipidemia, or a personal history of multiple CAD risk factors (e.g., smoking, high blood pressure).⁴

### Deciding Who to Treat

Patients' cardiovascular risk should be calculated using appropriate risk models, such as the Framingham Risk Score for men and women. Patients and their providers can then decide whether a 20 to 30 percent relative risk reduction translates into an absolute risk reduction large enough to be worth the cost, burdens, and potential side effects of medical treatment. The calculator can be found here: [http://cvdrisk.nhlbi.nih.gov/calculator.asp](http://cvdrisk.nhlbi.nih.gov/calculator.asp)

### Subjective Findings and History

- CAD or risk factors for CAD include underlying conditions, such as diabetes mellitus types 1 and 2, carotid artery disease, hyperthyroidism, liver disease, kidney disease, peripheral artery disease, and abdominal aortic aneurysm. Other risk factors include cigarette smoking, stress levels, hypertension (BP ≥140/90 or being treated for hypertension), family history of premature CAD in a first-degree relative, male gender, and increased age.
- A number of other risk factors for CAD have been suggested by epidemiologic data. These include obesity, physical inactivity, impaired fasting glucose, markers for inflammation, excess calorie consumption, excess alcohol consumption, homocysteine levels, abnormalities of thrombosis, and endothelial dysfunction.
- Use of drugs such as hormones, oral contraceptives, corticosteroids, retinoids, thiazide diuretics, and possibly antiviral drugs used to treat human immunodeficiency virus (HIV) infection and AIDS can cause triglyceride levels to increase.
- Genetics (familial or hereditary hyperlipidemia, familial dysbetalipoproteinemia or lipoprotein lipase deficiency and apolipoprotein CII deficiency).
Objective Findings

- Generally asymptomatic.
- If presents with other risk factors (as listed above) or CAD, may include chest pain (angina), history of a myocardial infarction (MI), or a stroke.
- High lipid levels can cause fat to be deposited in the skin and tendons and forms bumps called xanthomas.
- Very high triglyceride levels can cause the liver or spleen to enlarge and may increase the risk of developing pancreatitis, which can cause severe abdominal pain and is occasionally fatal.

Assessment

- A lipid profile is usually measured in fasting labs (12 hours) and a ten-year risk for developing CAD is determined and based on the Framingham Heart Study.5
  - Baseline lipid panel should be done at age 20 and then every 5 years if no other risk factors (family history of high cholesterol or other risk factors, like smoking or diabetes).
  - C-reactive protein (CRP) and lipoprotein (a).
- Cardiovascular exam.
- Peripheral vascular exam.
- Retinal exam.
- Comprehensive physical exam.

Plan

The Third Report of the Expert Panel on Detection, Evaluation and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III, or ATP III) from the National Cholesterol Education Program (NCEP) has summarized the current recommendations for the management of high serum cholesterol 7

- A 5-year clinical trial (4S) with over 4400 patients with heart disease found that lowering cholesterol lead to fewer heart attacks (37%) and reduced death from heart disease (42%) in men and women who already had heart disease and high cholesterol. Another study (CARE) showed that lowering cholesterol (using statins) in patients with heart disease reduced the risk of having another heart attack or dying by 24%. The LIPID study is another study that showed statins with dietary changes had a large effect on cholesterol numbers. It also reduced the overall death rate by 22%, heart attacks by 29%, stroke by 19% and the need for bypass or angioplasty by 20%,8,9,10

Lifestyle and Dietary Modifications

- Weight loss and increase in physical activity (30-60 minutes daily).11
- Regular moderate exercise works in combination with a low fat diet and has been shown to decrease triglycerides and LDL and increase HDL levels. Being
overweight lowers HDL cholesterol and increases risk of heart disease and stroke. Studies in children with familial hypercholesterolemia show that a heart healthy diet implemented with dietary advice can lower total cholesterol levels.\textsuperscript{12,13,14,15}

- Stress reduction (meditation, exercise, tai chi, learning and using coping skills).\textsuperscript{16,17}
- Nicotine cessation.
- Yoga.\textsuperscript{18}
- Dietary changes, including:\textsuperscript{19,20}
  - Mediterranean Diet.\textsuperscript{21}
  - Tibetan diet.\textsuperscript{22}
  - Soy protein.\textsuperscript{23,24}
  - Green tea.\textsuperscript{24}
  - Plant based diet.\textsuperscript{25}
  - Decrease “bad fats”, such as trans fats and increase polyunsaturated or monounsaturated fats\textsuperscript{26,27}
    - The Portfolio study took a variety of known cholesterol-lowering foods and compared their effect of this to the use of a statin-drug combined with a low-fat diet. The foods included plant sterols (found in vegetables, nuts (almonds), and seeds and legumes, soy protein, and soluble fiber. After one month, cholesterol reduction was 28\%, which was comparable to the statin/low-fat diet group and both these groups were statistically significantly better than control.\textsuperscript{29}
    - Decrease dietary cholesterol (this does not include a general limitation on eggs as previously reported).\textsuperscript{30,31,32,33}
    - Increase the amount of wild heart-healthy fish consumed.\textsuperscript{38}
    - Alcohol in moderation.
    - Increase in soluble fiber (fruits, vegetables, grains, oat bran, oatmeal, beans, peas, rice bran, barley, citrus fruits, strawberries, and apple pulp.\textsuperscript{34,35,36}

Supplementation or Nutraceuticals
- Fish and fish oil (DHA/EPA)
  - There is strong evidence to show that fish oils (EPA plus DHA) can decrease triglycerides and LDL, and increase HDL (2-4 grams/day, 4:1 EPA:DHA) in part by reducing liver production and release of VLDL. Reduction does appear to be dose dependent. If fish oil supplements are to be used, the label should be checked for contaminant testing (heavy metals and pesticides).\textsuperscript{37,38,39,40}
- Omega three rich oils (walnuts, almonds, avocados, flax seeds are all good sources of these “healthy oils”.\textsuperscript{41}
  - Certain nuts (almonds, pecans, macadamias, and walnuts) are high in
polyunsaturated or monounsaturated fatty acids and compounds such as plant sterols, and fiber. Consumption has been associated with a decrease in LDL. The American Heart Association (AHA) dietary guidelines suggest using nuts and other sources of unsaturated fatty acids as a replacement for foods containing saturated and trans-fatty acids.\textsuperscript{42,43}

- Flaxseed (20 - 50 g) is a very healthy fiber food and one benefit is it seems to reduce TC and LDL levels, but further studies are needed to determine its precise role in treating hyperlipidemia.\textsuperscript{44}
- Soluble Fiber (oat bran, barley flour, psyllium, legumes (peas and beans), fruits (apples, pears, prunes), some vegetables (yams, Brussels sprouts)).\textsuperscript{29,45,46}
  - Five to 10 g/day is associated with a 5% reduction in LDL. This can be obtained with a high-fiber diet or with dietary supplementation.\textsuperscript{47}
- Soy protein (tofu, soy milk, soy butter, edamame, soy burgers).\textsuperscript{29,15}
- Almonds\textsuperscript{48}, pistachios.\textsuperscript{49}
- Pomegranate seed oil.\textsuperscript{50}
- Garlic (mixed studies) (caution with blood thinners) \textsuperscript{51,52,53,54,55,56,57,58,59,60,61,62,63,64,23,65}
  - These occur naturally in some fruits, vegetables, nuts, seeds, legumes, vegetable oils, and other plant sources.
- Red yeast rice (some controversy regarding use).\textsuperscript{69,70,71,72,73,74}
- Policosanol (mixed results).\textsuperscript{75,76,77}
- Barley oil extract or fiber.\textsuperscript{78,79,80,81,82,83,84}
- CoQ10 (may decrease muscle pain associated with “statin” treatment)\textsuperscript{85,86}
- L-Arginine.\textsuperscript{23}
- Guggal lipid (mixed results).\textsuperscript{87,88,89,90,64,91}
- Pycnogenol.\textsuperscript{92}
- Various herbal medicines and combination supplements.\textsuperscript{93,94,95,96,97,98}
  - Curcuma longa (Curcumin),\textsuperscript{99} Irvingia gabonensis,\textsuperscript{100} Vaccinium macrocarpon (Cranberry),\textsuperscript{101} Monascus purpureus,\textsuperscript{102} Citrullus colocynthis,\textsuperscript{103} Hibiscus sabdariffa,\textsuperscript{104} Terminalia arjuna,\textsuperscript{64} Cinnamomum verum or spp. (Cinnamon),\textsuperscript{105,106} Cynara cardunculus (Artichoke) leaf extract,\textsuperscript{107,108} Berberis spp. Berberine,\textsuperscript{109} Achillea millefolium (Yarrow),\textsuperscript{110} Ocimum tenuiflorum (Holy basil),\textsuperscript{111} Aloe vera,\textsuperscript{112} Salvia miltiorrhiza,\textsuperscript{113} Pueraria lobata,\textsuperscript{114} Trigonella foenum-graecum (Fenugreek) seeds and leaves.\textsuperscript{115,116}
- Lycopene.\textsuperscript{117}
- Traditional Chinese Medicine (TCM)\textsuperscript{118,119} and Chinese Herbal Medicine.\textsuperscript{120,121}
- Whole system naturopathic care.\textsuperscript{122}
- Ayurvedic medicine.\textsuperscript{123}
- Anthocyanins.\textsuperscript{124}
Acupuncture
A lack of clinical-trial derived evidence precludes conclusions from being drawn, however there is a small body of data that suggests modest benefits may be observed for patients with mild hyperlipidemia but more research is warranted.\textsuperscript{125,126}

Prescription Medications (there are specific guidelines for drug treatment options based upon the National Cholesterol Education Program (NCEP; Adult Treatment Panel [ATP] III). These include treatment specifics for elevated cholesterol vs. triglycerides or both. A 2012 individual patient data meta-analysis found a reduction in all-cause mortality in patients without known vascular disease.\textsuperscript{127}

Treatment of elevated lipid levels in children is controversial.

- Lipid-lowering medications (statins). Statins are the strongest drugs for lowering LDL cholesterol and are the most effective researched drug for prevention of coronary heart disease, heart attack, stroke, and death. Statins may decrease the body's synthesis of cholesterol and can reduce LDL levels by as much as 20 to 60 percent. In addition, statins can lower triglycerides and slightly raise HDL cholesterol levels.\textsuperscript{128}
  - Side effects of statins include – most common is muscle pain, elevated liver enzymes and liver damage (LFTS should be measured at baseline and regularly. Rare adverse effects are rhabdomyolysis, digestive problems, rash or flushing, and neurological effects.\textsuperscript{129}
- Ezetimibe (cholesterol absorption inhibitors).
- Bile acid sequestrants (should be avoided until triglyceride levels have been normalized).
- Fibrates (gemfibrozil, fenofibrate and fenofibric acid).
- Nicotinic acid (Niacin) – available OTC or as a prescription in higher doses (Nicotinic acid may worsen glucose tolerance in diabetic patients).\textsuperscript{130,131,132}

Length of Treatment

- Lifestyle and diet modification may take 6-12 months to take effect.
- Supplementation or prescription medications may take 6-12 weeks for lab values to change. Labs should be rechecked every 3-6 months until values are optimized.
- The prevention and treatment of high cholesterol and/or triglycerides is a lifelong process.
- Stopping treatment or discontinuing beneficial changes in diet orexercise usually results in an increase in lipid levels.
Referral Criteria
Refer patients who may need a more extensive cardiovascular workup, those with significant personal or family history of cardiovascular disease, who develop concomitant risk factors or disease, or those who do not respond to treatment.

Resources for Clinicians


Resources for Patients
American Heart Association - http://www.americanheart.org/presenter.jhtml?identifier=1200000

Clinical Pathway Feedback
CHP desires to keep our clinical pathways customarily updated. If you wish to provide additional input, please use the e-mail address listed below and identify which clinical pathway you are referencing. Thank you for taking the time to give us your comments.

Clinical Services Department: providers@chpgroup.com

2 Adult Treatment Panel III at http://www.nhlbi.nih.gov/

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Hyperlipidemia or Dyslipidemia Clinical Pathway

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