Patient information: High cholesterol and lipids (hyperlipidemia) (Beyond the Basics)

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Literature review current through: Dec 2014. | **This topic last updated:** Dec 27, 2013.

INTRODUCTION — Hyperlipidemia refers to increased levels of lipids (fats) in the blood, including cholesterol and triglycerides. Although hyperlipidemia does not cause symptoms, it can significantly increase your risk of developing cardiovascular disease, including disease of blood vessels supplying the heart (coronary artery disease), brain (cerebrovascular disease), and limbs (peripheral vascular disease). These conditions can in turn lead to chest pain, heart attacks, strokes, and other problems. Because of these risks, treatment is often recommended for people with hyperlipidemia.

This topic reviews the risk factors for coronary artery disease (sometimes called just “coronary disease”), the types of lipids, and when cholesterol testing should begin. The treatment of high cholesterol is discussed separately. (See "Patient information: High cholesterol treatment options (Beyond the Basics)".)

OTHER RISK FACTORS FOR CARDIOVASCULAR DISEASE — In addition to hyperlipidemia, there are a number of other factors that increase the risk of cardiovascular disease and its complications:

- Diabetes mellitus, type 1 and 2 (See "Patient information: Diabetes mellitus type 1: Overview (Beyond the Basics)" and "Patient information: Diabetes mellitus type 2: Overview (Beyond the Basics)".)
- Hypertension (people with hypertension include those with a blood pressure at or above 140/90 and those who use blood pressure medication) (See "Patient information: High blood pressure in adults (Beyond the Basics)".)
- Kidney disease (See "Patient information: Chronic kidney disease (Beyond the Basics)".)
- Cigarette smoking
- Family history of coronary disease at a young age in a parents or sibling (young, in this case, means younger than 55 for men and younger than 65 for women)
- Gender: Men have a higher risk of cardiovascular disease than women at every age
- Age: There is an increasing risk of cardiovascular disease with increasing age

LIPID TYPES — The term lipids includes cholesterol and triglycerides. There are many different types of lipid (also called lipoproteins). Blood tests can measure the level of your lipoproteins. The standard lipid blood tests include a measurement of total cholesterol, LDL (low density lipoproteins) and HDL (high density lipoproteins), and triglycerides.

Total cholesterol — A high total cholesterol level can increase your risk of cardiovascular disease. However, decisions

about when to treat high cholesterol are usually based upon the level of LDL or HDL cholesterol, rather than the level of total cholesterol.

- A total cholesterol level of less than 200 mg/dL (5.17 mmol/L) is **normal**.
- A total cholesterol level of 200 to 239 mg/dL (5.17 to 6.18 mmol/L) is **borderline high**.
- A total cholesterol level greater than or equal to 240 mg/dL (6.21 mmol/L) is **high**.

The total cholesterol level can be measured any time of day. It is not necessary to fast (avoid eating for 12 hours) before testing.

LDL cholesterol — The low density lipoprotein (LDL) cholesterol (sometimes called "bad cholesterol") is a more accurate predictor of cardiovascular disease than total cholesterol. Higher LDL cholesterol levels increase your risk of cardiovascular disease.

Most healthcare providers prefer to measure LDL cholesterol after you have not eaten (fasted) for 12 to 14 hours. A test to measure LDL in people who have not fasted is also available, although the results may differ slightly.

Some healthcare providers make decisions about how to treat lipids based on a goal LDL cholesterol. If your healthcare provider uses this strategy, your goal LDL cholesterol will depend on several factors, including any history of cardiovascular disease and your risk of developing cardiovascular disease in the future (see 'Calculating risk' below). People at higher risk are often assigned a lower LDL cholesterol goal.

10-year risk of developing coronary artery disease

The 10-year risk score is based on information from the Framingham Heart Study, a large study that has followed participants, as well as their children and grandchildren, for greater than 50 years. The 10-year risk can be calculated for women (calculator 1) and for men (calculator 2).

Triglycerides — High triglyceride levels are also associated with an increased risk of cardiovascular disease, although this association is not typically important once other risk factors are taken into account. Triglyceride levels are divided as follows:

- Normal - less than 150 mg/dL (1.69 mmol/L)
- Borderline high - 150 to 199 mg/dL (1.69 to 2.25 mmol/L)
- High - 200 to 499 mg/dL (2.25 to 5.63 mmol/L)
- Very high - greater than 500 mg/dL (5.65 mmol/L)

Triglycerides should be measured after fasting for 12 to 14 hours.

HDL cholesterol — Not all cholesterol is bad. Elevated levels of HDL cholesterol actually lower the risk of cardiovascular disease. A level greater than or equal to 60 mg/dL or 1.55 mmol/L is excellent, while levels of HDL cholesterol less than 40 mg/dL or 1.03 mmol/L are lower than desired. There are no treatments for raising HDL cholesterol that has been proven to reduce the risk of heart attacks and strokes.

Similar to total cholesterol, the HDL-cholesterol can be measured on any blood specimen. It is not necessary to be fasting.

Non-HDL cholesterol — Non-HDL cholesterol is calculated by subtracting HDL cholesterol from total cholesterol. Since total cholesterol and HDL cholesterol can be measured without fasting, so can non-HDL cholesterol. Non-HDL cholesterol is a good predictor of cardiovascular risk and is a better predictor of risk than LDL cholesterol in people with type 2 diabetes and in women.

An appropriate non-HDL cholesterol goal can be calculated by adding 30 mg/dL (0.78 mmol/L) to your LDL cholesterol goal. As discussed, the LDL cholesterol goal depends on a number of factors. (See 'LDL cholesterol' above.)

CALCULATING RISK — Risk calculators are typically based on large studies of populations that are followed to see who develops cardiovascular disease. One such study, the Framingham Heart Study, has followed participants, as well as their children and grandchildren, for more than 50 years. Data from the Framingham Heart Study are used in the following calculators of 10-year risk for cardiovascular disease for women (calculator 1) and for men (calculator 2).

WHEN SHOULD I HAVE MY CHOLESTEROL LEVEL TESTED? — Many expert groups have guidelines for cholesterol screening. The guidelines differ in their recommendations about when to start screening, how frequently you should be screened, and when to stop.

One expert group, the United States Preventive Services Task Force recommends the following:

- Lipid screening should start at age 35 in men without other risk factors for coronary artery disease and at age 20 to 35 in men with risk factors. These include men with:
  - Diabetes
  - A family history of heart disease in a close male relative younger than age 50 or a close female relative younger than age 60
  - A family history of high cholesterol
  - A personal history of multiple coronary disease risk factors (eg, smoking, high blood pressure).
- Lipid screening should definitely start at age 45 and perhaps at age 20 in women with risk factors for coronary disease. No recommendation for or against screening was made for women without risk factors for coronary disease. UpToDate authors believe that even low risk women should be screened starting at age 45.
- Those at risk for coronary disease should be treated based upon the results of their screening test.
- Screening should include total cholesterol and HDL-cholesterol levels and can be measured anytime (with or without fasting).
- The optimal time interval between screenings is uncertain; reasonable options include every five years, with a shorter interval for those with high-normal lipid levels and longer intervals for low-risk individuals with low or normal levels.
- There is no recommendation to stop screening at a particular age.
- Screening may be appropriate in older people who have never been screened, although screening a second or third time is less important in older people because lipid levels are less likely to increase after age 65.

HIGH CHOLESTEROL TREATMENTS — The treatment options for people with high cholesterol and lipids are discussed separately. (See "Patient information: High cholesterol treatment options (Beyond the Basics)".)

WHERE TO GET MORE INFORMATION — Your healthcare provider is the best source of information for questions and concerns related to your medical problem.

This article will be updated as needed on our web site (www.uptodate.com/patients). Related topics for patients, as well as selected articles written for healthcare professionals, are also available. Some of the most relevant are listed below.

Patient level information — UpToDate offers two types of patient education materials.

The Basics — The Basics patient education pieces answer the four or five key questions a patient might have about a given condition. These articles are best for patients who want a general overview and who prefer short, easy-to-read

materials.

Patient information: Atherosclerosis (The Basics)
Patient information: Coronary heart disease (The Basics)
Patient information: Diabetes and diet (The Basics)
Patient information: The ABCs of diabetes (The Basics)
Patient information: Nonalcoholic fatty liver disease, including nonalcoholic steatohepatitis (NASH) (The Basics)
Patient information: Medicines after an ischemic stroke (The Basics)
Patient information: Heart attack recovery (The Basics)
Patient information: Medicines after a heart attack (The Basics)
Patient information: Recovery after coronary artery bypass graft surgery (CABG) (The Basics)
Patient information: Lowering the risk of having another stroke (The Basics)
Patient information: Coronary heart disease in women (The Basics)
Patient information: Can foods or supplements lower cholesterol? (The Basics)

Beyond the Basics — Beyond the Basics patient education pieces are longer, more sophisticated, and more detailed. These articles are best for patients who want in-depth information and are comfortable with some medical jargon.

Patient information: High cholesterol treatment options (Beyond the Basics)
Patient information: Diabetes mellitus type 1: Overview (Beyond the Basics)
Patient information: Diabetes mellitus type 2: Overview (Beyond the Basics)
Patient information: Transient ischemic attack (Beyond the Basics)
Patient information: Stroke symptoms and diagnosis (Beyond the Basics)
Patient information: Peripheral artery disease and claudication (Beyond the Basics)
Patient information: Abdominal aortic aneurysm (Beyond the Basics)
Patient information: High blood pressure in adults (Beyond the Basics)

Professional level information — Professional level articles are designed to keep doctors and other health professionals up-to-date on the latest medical findings. These articles are thorough, long, and complex, and they contain multiple references to the research on which they are based. Professional level articles are best for people who are comfortable with a lot of medical terminology and who want to read the same materials their doctors are reading.

Approach to the patient with hypertriglyceridemia
HDL-cholesterol: Clinical aspects of abnormal values
Intensity of lipid lowering therapy in secondary prevention of cardiovascular disease
Lipid lowering with diet or dietary supplements
Lipid lowering with drugs other than statins and fibrates
Lipid lowering with fibric acid derivatives
Lipoprotein(a) and cardiovascular disease
Inherited disorders of LDL-cholesterol metabolism
Screening for lipid disorders
Secondary causes of dyslipidemia
Statins: Actions, side effects, and administration
Treatment of drug-resistant hypercholesterolemia
Treatment of dyslipidemia in the older adult
Treatment of lipids (including hypercholesterolemia) in primary prevention
Treatment of lipids (including hypercholesterolemia) in secondary prevention

The following organizations also provide reliable health information.

- National Library of Medicine

(www.nlm.nih.gov/medlineplus/healthtopics.html)

- National Cholesterol Education Program of the National Heart, Lung, and Blood Institute of the NIH

(www.nhlbi.nih.gov/chd)

- American Heart Association

(www.americanheart.org)

- The Hormone Foundation

(www.hormone.org/questions-and-answers/2012/hyperlipidemia, available in English, Spanish, and Portuguese)

- The Framingham Heart Study

(www.framingham.com/heart/)

[1,2]

REFERENCES

1. National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) final report. Circulation 2002; 106:3143.
2. Grundy SM, Cleeman JI, Merz CN, et al. Implications of recent clinical trials for the National Cholesterol Education Program Adult Treatment Panel III guidelines. Circulation 2004; 110:227.

Topic 3440 Version 19.0

Disclosures

Disclosures: **Robert S Rosenson, MD** Grant/Research/Clinical Trial Support: Amgen [Lipids (Evolocumab)]; Sanofi [Lipids (Alirocumab)]; Astra Zeneca [Lipids (Epanova); Peripheral artery disease (Ticagrelor)]. Speaker's Bureau: Astra Zeneca [Lipids (Disease state management)]. Consulant/Advisory Boards: Aegerion [Lipids (Limitapide)]; Amgen [Lipids (Evolocumab)]; Astra Zeneca [Lipids (Epanova)]; Eli Lilly [Lipids (Disease state)]; GlaxoSmithKline [COPD (Relovir)]; Janssen [Diabetes (Canagliflozin)]; Novartis [DMC (Hedgehog inhibitor)]; Regeneron [Lipids (Disease state)]; Sanofi [Lipids (Alirocumab)]. Equity Ownership/Stock Options: Medicines Co; Teva. **Mason W Freeman, MD** Grant/Research Support/Clinical Trial Support: Sanofi [Rx of LDL-c (PCSK9 Ab)]. **David M Rind, MD** Employee of UpToDate, Inc. Equity Ownership/Stock Options (Spouse): Bonfire Development Advisors [CBT (iCBT)].
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