Coronary Heart Disease: Identifying Family Members at Risk

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Key Points

- Both genetic and environmental factors contribute to risk for coronary heart disease (CHD).
- Interventions directed at modifiable risk factors for CHD can reduce morbidity and mortality from CHD.
- When a patient is diagnosed with CHD, family members can benefit from identification and management of cardiac risk factors

Learning Objectives

Participants will be able to:

- Use family history to identify risk for CHD;
- Identify opportunities for family-centered CHD prevention following a diagnosis of CHD in one family member.

Family History Issues

Premature CHD is defined as CHD or sudden death occurring before age 55 years in a male or before age 65 years in a female. A history of premature CHD in a first-degree relative confers an approximately twofold increased risk of CHD.

Red Flags 

Several behavioral risk factors identify individuals with an increased risk of CHD, including sedentary lifestyle, cigarette smoking and high fat diet. These lifestyle factors are often shared among family members and can contribute to shared risk.

Case 5. A 47-Year-Old Man with a Heart Attack

A 47-year-old normotensive, non-diabetic man is admitted with an acute myocardial infarction (MI). After his hospitalization and subsequent recovery, he is found to have a serum cholesterol concentration of 295 mg/dL, with HDL cholesterol (HDL-C) of 35 mg/dL, LDL cholesterol (LDL-C) of 220 mg/dL, and triglycerides (TG) of 210 mg/dL. He is obese (body mass index, or BMI, ≥30 [see BMI calculator]), smokes one pack of cigarettes per day, and has been in the habit of eating a diet rich in high-calorie fatty foods such as hamburgers and French fries. He has two younger brothers. Family history is unknown, because the three brothers were raised by godparents after their parents were killed in an automobile accident.

Clinical Care Issues

The patient's care includes standard post-MI care, such as low-dose aspirin and beta-blocker therapy. In addition, his care should include a comprehensive review of cardiac risk factors to identify opportunities for risk reduction that will help to prevent a second MI. Modifiable CHD risk factors include:

- Hypertension
- Hyperlipidemia
- Cigarette smoking
- Diabetes mellitus
- Obesity
- Sedentary lifestyle

Based on risk factors already identified, the patient will benefit from efforts to address hyperlipidemia, cigarette smoking, and obesity. Evaluation of other modifiable risk factors is also indicated.

In addition, his recent MI represents a risk factor for his two brothers.

Risk Assessment

In addition to the risk factors noted above, both age and gender influence CHD risk. Risk of CHD increases with age; women tend to develop CHD later than men. For a non-smoking, normotensive 55-year-old man with a total cholesterol level <200 mg/dL, the probability of having a MI within eight

years is 31/1000. If he smokes, the risk is 46/1000; if he has high cholesterol (>260 mg/dL) and smokes, it is 64/1000. With the addition of hypertension (systolic >150 mmHg) to smoking and hypercholesterolemia, his risk of MI within eight years is 95/1000.

Family history is also a risk factor. The National Cholesterol Education Program (NCEP) Guidelines define premature CHD as CHD or sudden death occurring in a female before age 65 years or in a male before age 55 years. A family history of premature CHD in a first-degree relative (i.e., parent, sibling, or child) increases personal risk by about twofold.

We know nothing about this patient's family history. Based on epidemiologic data, his lipid abnormalities most likely reflect his poor dietary habits and obesity (and possibly a sedentary lifestyle). Background genetic factors — normal variants in genes coding for apolipoproteins and other proteins related to lipid metabolism — could have contributed as well. These factors, together with his cigarette smoking, could have precipitated his MI. There is also a small possibility that the patient has an inherited hyperlipidemia disorder such as familial hypercholesterolemia (FH) or familial combined hyperlipidemia (FCH) (see Case 4, Inherited causes of premature CHD).

Most importantly, the patient's early MI points to an increased risk of CHD for his brothers. Encouraging the patient to contact his brothers, to alert them to the benefits of assessing their risk and managing modifiable cardiac risk factors, is an important prevention opportunity.

Genetic Counseling and Testing

Counseling

Although background genetic factors are an important contributor to cardiac risk, it is unlikely that this patient has an inherited condition as the cause of his CHD. Thus, it is unlikely that he or his family will require genetic counseling to address their clinical needs. Nevertheless, it is appropriate to consider the implications of the patient's diagnosis for his brothers.

The patient's brothers would benefit from information about cardiac risk assessment. The patient should therefore be encouraged to:

- Inform his brothers about his MI, and about the importance of scheduling an appointment with their physician to evaluate their own cardiac risk.

- Inform his brothers about the value of lifestyle modifications in preventing CHD.

It may be appropriate to offer assistance to assure a proper evaluation for the patient's brothers. For example, the patient could be provided with a letter outlining the cardiac risk evaluation recommended for his brothers; or, if the brothers do not have a regular physician, they could be offered an appointment or a referral to an appropriate provider in their area.

Testing

Genetic testing is unlikely to be relevant in this situation. Rather, the patient's brothers would benefit from assessment of all modifiable cardiac risk factors through measurements of serum concentration of lipids and glucose; physical examination (BP, weight, calculation of BMI); and history (cigarette smoking, exercise habits).

Interventions

Whether cardiac risk results from genetic or non-genetic factors, the general approach to risk management is the same: Identification of all modifiable risk factors, and the use of lifestyle measures and medications to improve the risk profile.

Lifestyle modification is beneficial for all patients with cardiac risk factors, even if drug treatment is also required. Measures include regular exercise; low-fat diet; and smoking cessation (see sections below on physical activity and diet).

Drug treatment is an important component of the management of hypertension, hyperlipidemia, and diabetes mellitus.

Current NCEP guidelines for lipid management use the patient's risk status to determine the LDL cholesterol (LDL-C) threshold at which drug therapy should be initiated. For patients at the highest risk — patients who already have CHD or a CHD equivalent such as diabetes mellitus or carotid artery disease — NCEP recommends consideration of drug therapy when LDL-C is ≥130 mg/dL, and identifies drug therapy as an option when the patient's baseline LDL-C is ≥100 mg/dL; at the other end of risk spectrum, for patients without disease and with one or fewer cardiac risk factors, NCEP recommends consideration of drug therapy when LDL-C is ≥190 mg/dL. (Further discussion of lipid management can be found at the NCEP Web site.)

Increasing physical activity. Physical Activity and Health: A Report of the Surgeon General summarizes current findings and recommendations related to physical activity. This report notes that:

- People who are usually inactive can improve their health and well-being by becoming even moderately active on a regular basis.
- Physical activity need not be strenuous to achieve health benefits.
- Greater health benefits can be achieved by increasing the amount (duration, frequency, or intensity) of physical activity.

Many different kinds of physical activities can provide a health benefit, with a longer duration recommended for less intense activities. Exercise should occur on a daily basis if possible. The Surgeon General's Report includes the following examples of daily exercise (from less to more intense; see report for additional examples):

- Washing windows or floors for 45-60 minutes
- Gardening for 30-45 minutes
- Walking 1.75 miles in 35 minutes (20 min/mile)
- Pushing a stroller 1 1/2 miles in 30 minutes
- Raking leaves for 30 minutes
- Walking 2 miles in 30 minutes (15 min/mile)
- Swimming laps for 20 minutes
- Jumping rope for 15 minutes
- Running 1.5 miles in 15 minutes (10 min/mile)
- Shoveling snow for 15 minutes
- Stairwalking for 15 minutes

In addition, the report notes that "cardiorespiratory fitness gains are similar when physical activity occurs in several short sessions (e.g., 10 minutes) as when the same total amount and intensity of activity occurs in one longer session (e.g., 30 minutes), and for people who are unable to set aside 30 minutes for physical activity, shorter episodes are clearly better than none."

Diet. NCEP guidelines include the following essential features for a diet to reduce CHD risk:

- Reduced intake of saturated fats (to <7% of total calories), cholesterol (to <200 mg per day) and total fat (to 25-35% of total calories).
- Inclusion of plant stanols & sterols (found naturally in fruits, vegetables, nuts, seeds, cereals, legumes, and vegetable oils,

particularly soybean oil).
- Inclusion of 20-30 g per day of fiber, including 10-25 g per day of viscous (soluble) fiber (found naturally in oats, barley, soybeans, dried beans and peas, and citrus fruit).
- Balance of energy intake and expenditure to maintain desirable body weight.

Ethical/Legal/Social/Cultural Issues

Disincentives to addressing family risk for CHD

Although the familial nature of CHD has long been recognized, family-centered approaches to prevention are not routinely undertaken. In a study of follow-up after patients experienced cardiac events, including MI, cardiac bypass surgery, angioplasty, or treatment for cardiac ischemia, fewfer than 1% of medical records documented a plan to evaluate family members for cardiac risk factors, and only 18% of patients had their family screened within six months of the event [Swanson & Pearson 2001]. Similarly, many cases of familial hypercholesterolemia remain undetected, even among relatives of a diagnosed patient [Hopkins 2002].

Several factors might contribute to this low rate of family follow-up: a medical culture that identifies the doctor's primary responsibility as the individual patient, and places a high value on privacy; a mobile society in which family members often live at large distances from one another and receive care in different health care systems; and comparatively poor remuneration of preventive care services. These considerations suggest the need for innovative approaches for educating patients and physicians, and assisting both to provide prevention information to family members.

Resources

- **American Heart Association**
- **NIH National Cholesterol Education Program**
- **Physical Activity and Health: A Report of the Surgeon General**

- **GeneTests Online Medical Genetics Information Resource**

References

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