Management of Elevated Cholesterol Levels by New Hampshire Primary Care Physicians

Patrick M. Vivier, Allen J. Dietrich, MD, and Lee A. Witters, MD
Providence, Rhode Island, and Hanover, New Hampshire

While experts are reaching a consensus on the appropriate management of abnormal blood lipid levels, the attitudes and behaviors of practicing clinicians are not well defined. This study addresses the attitudes and management practices regarding blood lipids of a representative sample of family physicians and general internists in the state of New Hampshire as determined by a questionnaire mailed during late 1986. Physicians consider blood lipid testing to be important in adults, but vary widely in their idea of what levels represent high risk for coronary heart disease. Over 40 percent felt that cholesterol levels need to be 7.80 mmol/L (300 mg/dL) or greater to constitute a high risk for coronary heart disease for patients aged 40 to 59 years. In addition, physicians feel much less effective in managing lipid abnormalities than in managing hypertension. Family physicians and general internists did not differ significantly in behavior or attitudes. To implement new expert recommendations, substantial efforts will be required to convince physicians to adopt lower cholesterol levels as indicating high risk for coronary heart disease and to feel more effective in patient management.

A link between hyperlipidemia and coronary heart disease has been suspected for decades, but widespread agreement on the importance of blood lipid levels did not occur until 1984 with the publication of the results of the Lipid Research Clinics Coronary Primary Prevention Trial.[1,2] That study was followed by a 1985 National Institutes of Health (NIH) Consensus Development Conference[3] on the physician management of cholesterol and societal goals for lowering blood lipid levels. The 1985 NIH Consensus Development Conference conclusions focused on the need to lower elevated blood lipid levels, especially through lifestyle changes, and the need to identify high-risk groups through measurement of blood cholesterol in asymptomatic adults. The panel called for the creation of the National Cholesterol Education Program, which published its own report in 1987,[4] and which led to a revision of NIH recommendations. Other detailed

recommendations have also been published recently by the American Heart Association[5] and other experts.[6]

The current emphasis on abnormal blood lipid levels has similarities to the efforts in the 1970s to publicize the importance of controlling hypertension. Professional and public attention to hyperlipidemia is a relatively recent phenomenon, and how most physicians feel about the blood lipid issue is not clear. A recent audit of patient charts at a family practice clinic found that only 47 percent of detected abnormal patient lipid levels of 6.70 mmol/L (260 mg/dL) or greater received comment in the patient's record.[7]

Recent surveys of opinion found that in 1981 only 25 percent of Massachusetts physicians[8] and in 1983 only 41 percent of Maryland physicians[9] felt that counseling patients "to avoid high cholesterol foods" was very important in promoting health of the average person. There is some recent evidence, however, that physicians are placing more importance on cholesterol reduction. A 1986 national survey found that 64 percent of physicians considered an elevated cholesterol to have a significant effect on risk of coronary heart disease while only 39 percent held that opinion in 1983.[10]

Most of the recommendations of the 1985 NIH Consensus Development Conference are preventive measures, which are generally carried out by primary care physicians. Actions of primary physicians would have great potential

impact on achieving current public health goals concerning blood lipid levels. To discern current practice patterns of this group, New Hampshire primary care physicians were surveyed regarding their management of abnormal blood lipid levels.

METHODS

Selection of Physicians

A list of the state's family physicians was compiled from the 1984–1986 American Academy of Family Physicians Membership Directory[11] and the 1986 Directory of Diplomates of the American Board of Family Practice.[12] A list of the state's general internists was compiled from the American Medical Directory[13] and consisted of all internists who did not identify a subspecialty. Every other name on these lists (108 family physicians and 96 internists) was identified for potential participation in this study. (The other half of the family physician list became the sample for another study.) All physicians were contacted. Physicians were considered ineligible if they (1) no longer practiced in the state, (2) were subspecialists, or (3) were not in clinical practice. Of the physicians surveyed, 90 family physicians and 65 internists were eligible.

Survey Instrument

The study instrument consisted of a three-page questionnaire covering attitudinal and management issues related to elevated blood lipids and coronary heart disease. Physicians rated the importance of various tests and treatments on a five-point Likert-type scale according to their value in management of asymptomatic patients who have no special risk factors, such as cigarette smoking or a strong family history of coronary heart disease. Other answer categories are described below. The questionnaire was first mailed to physicians in August of 1986, with a second mailing to nonrespondents two and one-half weeks later. Nonrespondents were contacted by telephone and subsequent mailings. Nonrespondents were also checked against state licensing lists to verify addresses and current New Hampshire license status. The last survey returned was in January of 1987.

Data Analysis

Survey data were analyzed using the Statistical Package for the Social Sciences.[14] The responses of family physicians and general internists were compared using chi-square and Student's *t* tests as appropriate. Since responses generally agreed between groups, they are reported sep-

TABLE 1. 1985 NIH VALUES FOR SELECTING ADULTS AT MODERATE AND HIGH RISK REQUIRING TREATMENT*

Age Group (years)	Moderate Risk	High Risk
20 to 29	5.20 mmol/L (200 mg/dL)	5.70 mmol/L (220 mg/dL)
30 to 39	5.70 mmol/L (220 mg/dL)	6.20 mmol/L (240 mg/dL)
40 and over	6.20 mmol/L (240 mg/dL)	6.70 mmol/L (260 mg/dL)

* These 1985 recommendations[3] were modified in October 1987.[4] Current recommendations are that high risk is identified by a cholesterol level of 6.20 mm/L (240 mg/dL) or higher in patients 20 years old or older

arately only in the figures and when they differed significantly. A P value of less than .05 was defined as indicating statistical significance.

For purposes of this study, physicians' cholesterol standards for high coronary heart disease risk were considered to be in agreement with the 1985 Consensus Development Conference if physicians' standards were within 0.50 mmol/L (20 mg/dL) of the NIH standards. These standards are listed in Table 1, and were the standards in effect at the time of the survey. Implications of new standards for the significance of this survey are discussed later. Rather than a discrete level, this approximately 10 percent range around the NIH levels was chosen to indicate agreement because of physician uncertainties in the precision of the laboratory test and in compensating for rounding. Expert standards are offered to allow comparison, but not because they are necessarily more appropriate or meaningful for a given physician's practice population than that physician's standard.

RESULTS

Characteristics of Study Physicians

Seventy percent (63) of the eligible family physicians and 69 percent (45) of the eligible internists responded to the survey. Characteristics of the participating physicians are summarized in Table 2. The mean age of the respondents was 41.0 years for the family physicians and 41.7 years for the internists. The family physicians saw more patients per week than the internists (a mean of 96.6 vs 75.5), were more likely to practice in rural settings, and were somewhat more likely to practice in a group, while internists were more likely to practice in a hospital setting. The physician sample was overwhelmingly male. Nonrespondents for whom the information was available were somewhat older than respondents.

TABLE 2. CHARACTERISTICS OF STUDY PHYSICIANS

Characteristics	Family Physicians	Internists
Number of eligible physicians	90	65
Number (%) of responding physicians	63 (70.0)	45 (69.2)
Age (mean ± standard deviation)	41.0 ± 11.1	41.7 ± 11.5
Patients seen per week* (mean ± standard deviation)	96.6 ± 30.1	75.5 ± 34.5
Location of practice*		
Urban	4.8**	28.9
Rural	61.9	37.8
Suburban	25.4	17.8
Not reported	7.9	15.6
Type of practice*		
Solo fee-for-service	44.4	53.3
Group fee-for-service	30.2	11.1
Clinic	6.3	4.4
Hospital	1.6	13.3
Health maintenance organization	9.5	4.4
Other	4.8	4.4
Not reported	3.2	8.9
Sex		
Percent male	93.7	93.3

* $P < .05$
** All numbers that follow represent percentage of family physicians or internists selecting each category of response

Importance of Blood Lipids as a Risk Factor for Coronary Heart Disease

Both groups of physicians believe that elevated blood lipid levels can contribute to coronary heart disease. Ninety-four percent responded that blood lipids are moderately or very important in independently contributing to an individual's risk for coronary heart disease. (For the purposes of this study, coronary heart disease was defined as angina, characteristic electrocardiagram changes, myocardial infarction, or sudden death.) In addition, 75 percent thought that reducing elevated blood lipid levels may have a substantial effect on diminishing risk of coronary heart disease.

Importance of Routine Testing of Blood Lipids

A summary of physicians' responses as to the importance of measuring blood lipid levels in the routine care of patients in various age groups is presented in Table 3. Ninety-five percent of physicians believe that routine measurement of blood lipid levels is moderately or very important in the routine general care for patients in the 40- to 59-year-old age group, and 75 percent considered routine testing of patients aged 60 years and older to be moderately

or very important. Over 80 percent of physicians estimated that they actually assess blood lipids in their regular asymptomatic patients in the 40-year-and-over age group at least every five years.

For younger adult patients, 73 percent of the family physicians and 89 percent of the internists considered it moderately or very important routinely to test patients for blood lipid levels in the 20- to 39-year-old age group. Of those responding to the question, 37 percent of the family physicians and 48 percent of the internists estimate that they actually assess blood lipid levels at least once every five years in their asymptomatic patients in the 20- to 39-year-old age group. An additional 37 percent of the family physicians and 25 percent of the internists estimate that they assess blood lipids at least once in asymptomatic patients during this age span.

For the youngest patient age groups, the perceived importance of routine measurement dropped off considerably. For the 10- to 19-year-old age group, only 24 percent of the family physicians and 40 percent of the internists felt that routine testing was moderately or very important. Even fewer of the physicians saw a role for routine testing of the 2- to 9-year-old age group. One third of all the physicians were uncertain or did not respond to the question as to the importance of routine testing in this age group, and another 32 percent felt blood lipid measurement was not important.

Evaluation of Blood Lipids

The most useful test for estimating blood lipids was felt to be total plasma cholesterol, with over 97 percent of both groups finding this test to be moderately or very useful to them in assessing blood lipids with regard to the risk of coronary heart disease. Also felt to be moderately or very useful were high-density lipoprotein cholesterol (90 percent of physicians), the ratio of high-density to low-density lipoprotein (88 percent of physicians), and total triglycerides (70 percent of physicians). Lipoprotein electrophoresis was regarded as less useful, with only 39 percent of all physicians considering it moderately or very useful. Forty-eight percent of the physicians found it not useful, and an additional 13 percent were unsure.

The physicians were asked to define what total blood cholesterol level they used to identify being at high risk for coronary heart disease in otherwise normal patients of various ages. On the survey, the physicians marked their criteria on a linear scale from 3.90 mmol/L (150 mg/dL) to over 10.50 mmol/L (400 mg/dL). There was a great deal of variability among physicians, with responses spread out across the scale. For the moderate risk category, more than one half of the physicians were within 0.50 mmol/L (20 mg/dL) above or below the 1985 NIH standards for the given age group. For the definition of the

TABLE 3. IMPORTANCE OF BLOOD LIPID MEASUREMENT IN ROUTINE CARE OF PATIENTS OF DIFFERENT AGES AS PERCEIVED BY A PERCENTAGE OF EACH PHYSICIAN GROUP

Patient Age Groups (years)	Not Important	Slightly Important	Moderately Important	Very Important	Not Specified*
Family Physicians					
2 to 9	38.1	22.2	6.3	1.6	31.7
10 to 19	20.6	34.9	15.9	7.9	20.6
20 to 39	1.6	19.0	28.6	44.4	6.3
40 to 59	0.0	4.8	28.6	66.7	0.0
60 and older	3.2	22.2	52.4	20.6	1.6
Internists					
2 to 9	24.4	17.8	6.7	15.6	35.6
10 to 19	8.9	28.9	15.6	24.4	22.2
20 to 39	0.0	8.9	22.2	66.7	2.2
40 to 59	0.0	4.4	22.2	73.3	0.0
60 and older	2.2	20.0	33.3	44.4	0.0

Note: Percentages indicate how the 63 family physicians and 45 internists, respectively, categorized the importance of testing for each age group. Differences did not reach statistical significance.
* The "not specified" category includes those who checked "uncertain" as well as those who did not answer

high-risk category, most of the physicians used a total blood cholesterol level more than 0.50 mmol/L (20 mg/dL) above the NIH values (Figures 1 and 2). Forty-seven percent of physicians felt a value of 7.75 mm/L (300 mg/dL) or greater signified a high risk of coronary heart disease for patients in the 40- to 59-year age group.

Treatment

For the moderate-risk category as defined by the physician, lifestyle changes were much preferred over drugs to lower blood lipid levels. Over 75 percent of physicians felt that a low saturated fat and low cholesterol diet, regular exercise, and weight reduction were moderately or very important in lowering elevated blood lipid levels. A high polyunsaturated fat diet was rated as moderately or very important by 52 percent of the family physicians and 65 percent of the internists. Lipid-lowering drugs were considered the least important for the physicians' moderate-risk patient group. Thirty-eight percent of physicians rated drugs as moderately or very important.

Lifestyle changes were also considered important for the high-risk group, while lipid-lowering drugs increased in importance in this patient group. Sixty-nine percent of the family physicians and 82 percent of the internists rated drugs as moderately or very important for their high-risk category.

In dealing with elevated blood lipid levels, 19 percent of the responding physicians felt that they were very or extremely effective. When asked the same question about hypertension, 86 percent of the physicians responded that they were very or extremely effective.

DISCUSSION

Throughout the survey, trends were similar for both internists and family physicians. The physicians clearly agree with published guidelines that blood lipids are an important consideration in the prevention of coronary heart disease, and that routine testing is important for adult patients. They also claim to assess blood lipid levels in their asymptomatic patients. There was little agreement on what total plasma cholesterol level constitutes high risk for coronary heart disease. Between 50 percent and 60 percent of the physicians used high-risk values more than 0.50 mmol/L (20 mg/dL) above the 1985 NIH standards for each of the adult age categories, and one fourth to one half of the physicians used a high-risk level of 7.75 mmol/L (300 mg/dL) or greater.

With the 1987 standards for high risk now 6.20 mmol/L (240 mg/dL) or higher for all age groups, this divergence between NIH and physician standards might be even larger for patients aged 40 years and over if physicians were asked this question today. This is not to say, however, that the experts are right and practicing physicians are wrong about standards that should be applied to a specific community practice. The physician is in the best position to know what is right for his or her practice. It is the responsibility of expert bodies to make the case for their standards, especially how these standards should be modified depending on health care priorities and needs of specific practice populations.

Many physicians were uncertain about what approach to take in the pediatric age group. General internists as well as pediatricians and family physicians have a re-
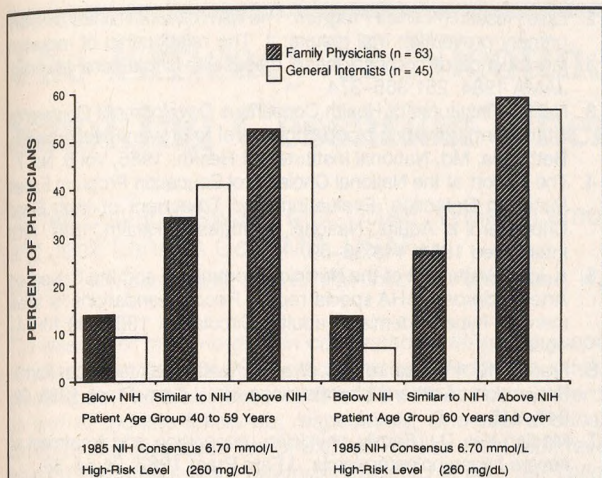
Figure 1. Percentage of primary physicians who defined age-specific high-risk cholesterol levels similar to, below, and above 1985 NIH recommendations. Similar to NIH means the physician's value was within ±0.50 mmol/L (20 mg/dL) of the 1985 NIH Consensus Development Conference recommendations level.[3] For 20- to 29-year-old patients, no general internists had a high-risk level lower than those recommended by NIH. Since this study was done, new recommendations have come forth that the high-risk standard is 6.20 mmol/L (240 mg/dL) or greater for patients aged 20 years and older
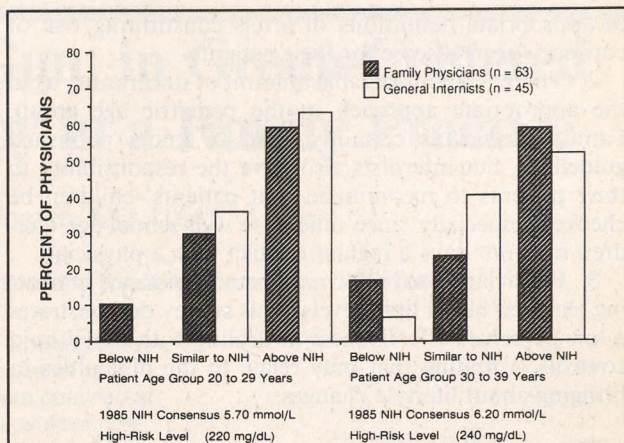

Figure 2. Percentage of primary physicians who defined age-specific high-risk cholesterol levels similar to, below, and above 1985 NIH recommendations. Similar to NIH means the physician's value was within ±0.5 mmol/L (20 mg/dL) of the 1985 NIH Consensus Development Conference recommendations level.[3] Since this study was done, new recommendations have come forth that the high-risk standard is 6.2 mmol/L (240 mg/dL) or greater for patients aged 20 years and older

sponsibility to develop a practice policy about lipid testing in children. Many school-age children have few physician contacts. The parents' internist may be a crucial source of information. The majority of responding family physicians (64 percent) and internists (56 percent) do not assess blood lipid levels in their regular (asymptomatic) patients in the 2- to 19-year age group. This finding is consistent with those of a recent survey,[15] which found that greater than 90 percent of the primary care pediatricians did not include testing of lipid levels during well-child visits unless the child was at high risk.

As for treatment, the physicians consider themselves much less effective in dealing with abnormal lipid levels than with hypertension. The perceived lack of effectiveness could be related to the inherent difficulties in achieving lifestyle changes and to the negative side effects of the lipid-lowering drugs, which received a high rating of importance for the high-risk patient group.

This study has several strengths and limitations that should be recognized. It reached a substantial proportion of active New Hampshire physicians providing primary care to adults. In addition, physicians responded regarding both their attitudes and their current management practices. What physicians say they do, however, not what actually happens in the office was evaluated. Physicians

may well have overestimated what they actually do. Also, physician agreement with NIH consensus levels was defined arbitrarily to be within 0.50 mmol/L (20 mg/dL). If within 0.80 mmol/L (30 mg/dL) was the range, however, the results would not have differed substantially. Finally, in the months since this study was done, a new cholesterol-lowering agent has gotten substantial attention in the media, and new government reports have followed. These events may have influenced physicians' behavior to some extent. A follow-up survey should be done when new recommendations are widely disseminated and new drugs are in common use.

In summary, the attitudes of the physicians surveyed have several implications for future physician education programs. Physicians are already aware of the importance of blood lipids in coronary heart disease and the importance of routine testing of adults. This area does not need reinforcement. Rather, this research points out the following three areas that need to be addressed:

1. Physicians should better understand the levels at which blood lipids become a risk factor. The great variability among physician practices could breed confusion among patients, who get much of their own information through the media. In addition, the very high cholesterol levels used as standards by a large proportion of physicians may result in undertreatment of many at-risk patients. Physician education must focus on convincing physicians

of appropriate definitions of levels constituting risk of coronary heart disease for their patients.

2. There is a considerable amount of uncertainty as to the appropriate approach in the pediatric age group. Family physicians certainly need to know published guidelines, but internists also have the responsibility to their patients to recommend that patients' children be checked, especially since otherwise well school-age children may not have a regular contact with a physician.

3. Physicians need information and assistance in treating elevated blood lipid levels. This survey demonstrates a low perceived effectiveness in dealing with blood lipid controls, a finding that may relate to the difficulties in bringing about lifestyle changes.

This study identifies gaps in physician management practices and suggests an agenda for physician training to implement recent expert recommendations. Future studies should both confirm current practices in other geographic areas using other methodologies, and test the impact on education interventions to influence physician behavior.

Acknowledgment

References

1. Lipid Research Clinics Program: The lipid research clinics coronary primary prevention trial results: I. Reduction in incidence of coronary heart disease. JAMA 1984; 251:351–364

2. Lipid Research Clinics Program: The lipid research clinics coronary primary prevention trial results: II. The relationship of reduction in incidence of coronary heart disease to cholesterol lowering. JAMA 1984; 251:365–374

3. National Institutes of Health Consensus Development Conference Statement: Lowering blood cholesterol to prevent heart disease. Bethesda, Md, National Institutes of Health, 1985, vol 5, No. 7

4. The Report of the National Cholesterol Education Program Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults. National Institutes of Health, 1987. Arch Intern Med 1988; 148:36–69.

5. A Joint Statement of the Nutrition Committee and the Council on Arteriosclerosis: AHA special report: Recommendations for treatment of hyperlipidemia in adults. Circulation 1984; 69:1067A–1089A

6. Frame PS: A critical review of adult health maintenance: Part 1: Prevention of atherosclerotic diseases. J Fam Pract 1986; 22: 341–346

7. Madlon-Kay DJ: Family physician recognition and treatment of severe hypercholesterolemia. J Fam Pract 1987; 24:54–56.

8. Wechsler H, Levine S, Idelson RK, et al: The physician's role in health promotion—A survey of primary-care practitioners. N Engl J Med 1983; 308:97–100.

9. Sobal J, Valente CM, Muncie HL, et al: Physicians' beliefs about the importance of 25 health promoting behaviors. Am J Public Health 1985; 75:1427–1428

10. Schucker B, Wittes JT, Cutler JA, et al: Change in physician perspective on cholesterol and heart disease. JAMA 1987; 258:3521–3526

11. 1984–1986 American Academy of Family Physicians Membership Directory. Kansas City, Mo, American Academy of Family Physicians, 1984

12. 1986 Directory of Diplomates of the American Board of Family Practice. Lexington, Ky, American Board of Family Practice, 1986

13. American Medical Directory, ed 29. Chicago, American Medical Association, 1985

14. Statistical Package for the Social Sciences User's Guide. Chicago, SPSS Inc, 1983

15. Nader PR, Taras HL, Sallis JF, Patterson TL: Adult heart disease prevention in childhood: A national survey of pediatricians' practices and attitudes. Pediatrics 1987; 79:843–850