Cholesterol Treatment Practices of Primary Care Physicians

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Synopsis

The active involvement of primary care physicians is necessary in the diagnosis and treatment of elevated blood cholesterol. Empirical evidence suggests that primary care physicians generally initiate dietary and pharmacological treatment at threshold values higher than is currently recommended. To determine current treatment thresholds and establish factors that distinguish physicians who are more likely to initiate therapy at lower cholesterol values, 119 primary care physicians in four northern California communities were surveyed. Data collection included their demographic factors, treatment of hypothetical patients, self-efficacy regarding counseling patients about cholesterol reduction and personal health behaviors, outcome expectations, and cholesterol knowledge and attitudes.

Results indicated that 59 percent of respondents would not start dietary treatment on a middle-aged female patient with a cholesterol of 215 milligrams per deciliter (mg per dl). Only 44 percent of respondents indicated that they would initiate pharmacological therapy for a middle-aged man with a cholesterol of 276 mg per dl. Logistic regression models were used to determine characteristics that influenced dietary and pharmacological treatment practices. Younger physicians, those who had had their own cholesterol checked, and those who personally ate a low-fat diet, were more likely to recommend diet therapy to patients with modest elevations of cholesterol. Willingness to use lipid lowering medications at more marked elevations was associated only with increased self-efficacy regarding use of drugs to lower cholesterol. These results indicate that physicians' personal health behaviors and self-efficacy should be addressed in interventions to modify cholesterol-related practice behavior.

DESPITE DECLINING mortality for more than 20 years attributed to coronary heart disease (CHD), it remains the leading killer of Americans today. Elevated serum cholesterol is a major risk factor for CHD. Approximately one-half the adult American population have values above the desirable level—200 milligrams per deciliter (mg per dl)—and almost 25 percent have high cholesterol levels—above 240 mg per dl (*1*).

The National Cholesterol Education Program (NCEP) is a major Federal initiative to address the nation's cholesterol problem (*2*). A primary goal of the NCEP is to increase the activity of primary care physicians in the detection and subsequent dietary and pharmacological management of hypercholesterolemia. The NCEP recommends that all persons with cholesterol values above 200 mg per dl be counseled regarding a low-fat diet (*1*). Furthermore, persons with values above 240 mg per dl should receive further lipoprotein measurements. Persons with elevated low density lipoprotein cholesterol (LDL-C) who do not respond to a medically supervised dietary intervention are to be considered for lipid lowering medication. Persons with cholesterol values between 200 mg per dl and 240 mg per dl and two or more other common CHD risk factors should also have further testing and be prescribed an aggressive dietary intervention and drug therapy if necessary.

The cholesterol levels targeted for intervention by the NCEP are lower than those commonly used by physicians in the United States. In a 1986 national

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survey, only about half of physicians reported that they would routinely begin dietary therapy for a middle-aged man with a cholesterol value of 240 mg per dl (*3*). Several investigations using clinical chart reviews indicate that physicians do not routinely intervene on patients' elevated cholesterol levels, even patients who have already had a myocardial infarction (*4,5*). Patients generally consider their physician to be a highly credible source of health and dietary information (Flora, J. A., Maibach, E., and Slater, M. D.: "The relationship between health, lifestyle, media use, and interpersonal communication." Institute for Communication Research, Stanford University, 1991. Unpublished manuscript).

This credibility and the potential for physicians to substantially improve the public's health through intervention to lower cholesterol levels make it imperative that physicians' practices comply with recommendations for prevention-oriented cholesterol treatment.

Increasing physicians' activity in preventive medicine, and specifically in cholesterol intervention, is challenging. Increasing their reimbursement or changing the organization of health care delivery may not be sufficient to achieve this change (*6*). Knowledge-based approaches are also unlikely to be sufficient, in that continuing medical education courses and consensus conference statements have not had a demonstrable effect on physicians' practice behaviors (*7,8*). A better understanding of the factors associated with variations in practices followed in cholesterol treatment will be important in efforts to design programs that successfully encourage cholesterol reduction.

Several variables have been reported to influence physicians' prescribing of other preventive interventions. These include age, specialty, beliefs about the effectiveness of intervention, knowledge about the risk factor, perceived ability to intervene, personal health behaviors, concern about a patient's response, and external barriers (*9–13*). Lewis and colleagues, for example, were able to account for 35 percent of the variance in physicians' counseling about alcohol, smoking, exercise, and weight control using physicians' attitudes, specialty, and personal habits as predictors (*14*).

Few studies have examined predictors of physician practice from a theoretical perspective, which may improve understanding of the process and lead to more effective strategies for changing provider behavior. Social learning theory can be used to conceptualize predictors of treatment and counseling practices (*15*). Social learning theory states that people's perceived ability to successfully enact specific behaviors (termed self-efficacy) is a major determinant in their adoption and maintenance of those behaviors. Self-efficacy is not a general personality trait, but is specific to particular behaviors. That is, perceived self-efficacy to counsel a smoker is not the same as perceived self-efficacy to counsel a patient requiring dietary change.

Social learning theory also states that people's assessment of the importance and possible benefit of the behavior under consideration (termed outcome expectation) is also a determinant of adoption and maintenance of the behavior. Social learning theory has been successful in predicting changes in health behavior and has served as the basis for designing successful behavioral change strategies (*16*). Physician self-efficacy has been shown to be associated with enhanced rates of counseling on cholesterol reduction and reduction of human immunodeficiency virus (HIV) risk behavior (*17,18*).

The purpose of this research was to study physicians' cholesterol treatment practices and identify factors that influence them. Social learning theory and past research on physicians' patterns of treatment led us to consider the physician's knowledge, self-efficacy, outcome expectations, personal health habits, and demographics as possible independent predictors of practices in cholesterol treatment.

Methods

Population. All physicians in four moderate-sized northern California communities were recruited to participate in the survey during 1986. Mailing lists were obtained from the local medical societies and from physician staffs at local hospitals. The communities were the two education and two control communities of the Stanford Five City Project (FCP), a longitudinal intervention trial to reduce CHD morbidity, mortality, and risk (*19*).

All physicians were sent a letter describing the

survey and the questionnaire. After 3 weeks, nonrespondents were sent a second questionnaire by mail. Nonrespondents received a followup phone inquiry after another 3 weeks.

Because of our interest in treatment patterns of adult patients in primary care settings, we analyzed only participants in general practice, family practice, internal medicine, and internal medicine subspecialties who spent more than 50 percent of their time in primary care, a total of 233 physicians. Information on nonrespondents was obtained from directories of the American Medical Association, which include nonmembers. Overall, 119 or 51 percent of physicians who could be identified as general practitioners, family physicians, or general internists in these directories responded to the survey.

Respondents and nonrespondents were equivalent in distribution of specialty (internal medicine versus family practice) and in year of graduation from medical school. The respondents were more likely to have graduated from medical school in the United States (96 versus 86; $P<.05$) than elsewhere.

Instrument. The eight-page questionnaire was based on an earlier instrument administered by the FCP (*20*). Physicians were asked about their advice to patients regarding preventive practices in weight control, smoking, blood pressure, cholesterol, and exercise. Only the responses on cholesterol results are reported in this paper.

Measures. The measures investigated in the questionnaire included information about the physicians and their treatment and advice given to their patients.

Demographics. Physician's age, sex, medical speciality, number of patients seen per week, and practice location (FCP intervention cities versus control cities) were each assessed.

Knowledge. Respondents were presented a list of seven possible nonpharmacological means of influencing a patient's LDL-C, or high density lipoprotein cholesterol (HDL-C), or both. They were asked to check off the items which have an impact on each subfraction. A cholesterol knowledge index was computed from these answers by adding a point for each correct response and subtracting a point for each incorrect response. The possible range for this index was −14 to 14.

Table 1. Percent of 119 respondents stating that specific nonpharmacological interventions would improve low density lipoprotein cholesterol (LDL-C) or high density lipoprotein cholesterol (HDL-C)

Intervention	*LDL-C*	*HDL-C*
Exercise	77.3	92.4
Weight loss in obese people	87.4	62.2
Stress reduction	37.8	33.6
Diet	92.4	67.2
Increased dietary fiber	60.5	36.2
Calcium supplements	10.1	8.4
Smoking cessation	52.9	48.7

Outcome expectations. Physicians were asked to rate the effect of various preventive measures on CHD using a three point scale (little or no effect, moderate effect, large effect). The preventive measures rated were reductions in elevated serum cholesterol, elevated blood pressure, cigarette smoking, being overweight, and sedentary lifestyle.

Personal health habits. Respondents replied to a number of questions about their own health and health practices. Personal involvement with cholesterol was determined by asking if the physician had personally had a cholesterol measurement within the previous 5 years. Dietary involvement was ascertained by asking if the respondent personally eats a low-fat, low-cholesterol diet. Smoking status (yes-no), regular exercise (at least three times per week), and body weight (more or less than 10 lbs. overweight) were used in a three item index of other personal preventive practices.

Self-efficacy. Respondents were asked to rate, on a scale of 0 to 100, their confidence in their ability to successfully perform seven preventive interventions related to cholesterol lowering. Factor analysis was performed on the seven self-efficacy items. This resulted in two factors: self-efficacy regarding dietary counseling, and self-efficacy regarding the use of drugs to lower cholesterol. The Cronbach's coefficient alpha's for these two self-efficacy scales were .89 and .94, respectively.

Cholesterol monitoring practices. Respondents stated whether or not a complete examination in their office includes a total cholesterol evaluation, and they estimated the proportion of their patients, ages 40–60, for whom they had ever obtained a lipid profile.

Cholesterol treatment practices. To estimate the cholesterol levels at which the respondents initiate

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dietary and pharmacological therapy, three hypothetical patient profiles were presented. The patients were a 53-year-old woman, a 26-year-old man, and a 48-year-old man. All were otherwise healthy without other risk factors for heart disease. For each patient, respondents were asked to evaluate five different cholesterol levels and to specify, at each level, if they would usually (*a*) take no action, (*b*) recommend diet therapy, or (*c*) recommend diet and drug therapy. The five cholesterol levels were approximately the 25th, 50th, 75th, 90th, and 99th percentile for each age and sex. Only the cholesterol values and not the percentiles were included in the case scenarios.

Lipid lowering drug use in the community sample. As part of the FCP, a random sample was drawn from the general population and these people were examined on four occasions spaced over 5 years. Among other measures, they had cholesterol level determinations, and their current medications were recorded. The results of the cholesterol measurements were sent to the person's personal physician, if one had been reported. The last of these four cholesterol measurements and drug histories of the community sample occurred at approximately the same time as the physician survey.

Results

Demographics. The respondents had a mean age of 48 years and 91 percent were men. They had been in practice a mean of 17 years and saw an average of 85 patients a week. General internists and internal medicine subspecialists who spent more than half their time in primary care made up 54 percent of the sample, and family physicians and general practitioners constituted the rest.

Knowledge. The respondents were asked which nonpharmacological interventions influence LDL-C and HDL-C levels. Table 1 shows that the role of diet in modulating LDL-C was nearly universally appreciated (92 percent). Although the importance of smoking cessation cannot be overemphasized, more than half of the respondents made an incorrect extrapolation to infer that smoking cessation lowers LDL-C.

Outcome expectations. The role of cholesterol as a risk factor for CHD was widely appreciated by respondents. Nearly three-quarters of the respondents (74 percent) believed that reducing an elevated blood cholesterol level has a large effect on the reduction of coronary heart disease. Another quarter (25 percent) believed that it has a moderate impact. The importance of cholesterol reduction was ranked on par with smoking and hypertension and substantially higher than obesity and sedentary lifestyles.

Personal health habits. More than 87 percent of the respondents reported having had their cholesterol measured in the previous 5 years, and 68 percent reported that they ate a low-fat and low-cholesterol diet. Only 3 percent of the respondents smoked, and 72 percent exercised at least three times a week. However, 70 percent consider themselves to be 10 pounds or more overweight. There were no significant differences in these variables by physicians' age, specialty, or city of practice.

Perceived ability to intervene. Table 2 presents the mean scores for each of the seven self-efficacy items. Mean ratings ranged from 46 (ability to achieve long-term cholesterol reduction through dietary counseling) to 73 (ability to counsel patients on cholesterol lowering diets). Quite predictably, respondents felt least efficacious in their ability to effect long-term behavioral changes and most efficacious in their ability to offer advice such as dietary counseling or in their ability to prescribe a specific diet.

Cholesterol treatment practices. Nearly all respondents reported that they include a total cholesterol measurement in their complete examination of a patient. Yet they reported having a cholesterol value on file for only 34 percent of their patients in the age range of 40 to 60 years. Table 3 presents reported treatment practices for the three hypothetical patients. Respondents proposed to treat the two middle-aged patients in a similar manner. For these patients, 30 to 40 percent of respondents recommended dietary changes at the 50th percentile of the population's cholesterol distribution, and about

three-quarters of the respondents recommended dietary modification at the 75th percentile.

At the 90th percentile, termed "high risk" by the 1984 Consensus Conference, 95 percent of the respondents reported recommending at least diet therapy with slightly more than 20 percent also recommending a cholesterol lowering drug. At the 99th percentile (285 mg per dl for the female and 276 mg per dl for the male patient), more than 95 percent of respondents stated they would normally use at least diet therapy, and about 45 percent would also add drug therapy. The treatment offered to the 26-year-old man was, on a percentile basis, somewhat less aggressive, possibly reflecting a tendency for physicians to react to absolute cholesterol level and not percentile.

Predictors of practice. For cholesterol levels at the 50th percentile in the middle-aged patients (values of approximately 210 mg per dl), about one-half the respondents recommended taking no action, and the other half recommended dietary treatment. With cholesterol levels at the 95th percentile in the middle-aged patients (values of approximately 280 mg per dl), almost all respondents recommended dietary intervention, but fewer than half recommended the additional use of drug therapy. Separate logistic regression models were constructed to identify characteristics of physicians who take the more active option for patients with modest or extreme cholesterol values. The younger patient was excluded from this analysis because the absolute cholesterol values are much lower, and current treatment recommendations are based on absolute rather than percentile levels (*1*).

The variables hypothesized to be determinants of physician behavior, and therefore included in the model were

- knowledge about cholesterol reduction,
- outcome expectations regarding the importance of cholesterol reduction,
- self-efficacy to achieve results with diet therapy and drug therapy,
- personal diet,
- personal history of cholesterol measurement,
- other personal preventive health practices, and
- demographic factors including age, specialty, and city of practice.

For the hypothetical middle-aged male patient with a cholesterol of 211 mg per dl, the physician factors associated with recommending a cholesterol lowering diet rather than taking no action were age (more of the younger physicians recommended a diet), personally eating a low-fat diet, and having had their own cholesterol measured within the last 5 years (table 4). The logistic regression model for the hypothetical female patient produced the same set of physician characteristics.

For the hypothetical middle-aged male patient with a cholesterol value of 276 mg per dl, only one variable was associated with an increased likelihood of using both diet and drug therapy as opposed to diet alone: having a higher self-efficacy in his ability to use lipid lowering drugs (relative risk 1.47, 95 percent confidence interval, 1.13–1.91). The logistic regression model constructed for the

Table 2. Physicians' mean perceived self-efficacy to treat patients with elevated cholesterol values (rated 0 "not at all confident" to 100 "very confident")

Behavior	Mean	Standard deviation
Provide diet counseling	73	26
Provide a specific diet	68	27
Achieve short term diet changes	62	26
Achieve long-term diet changes	46	24
Utilize pharmacological interventions	56	29
Maintain pharmacological interventions	49	28
Evaluate dietary programs	63	27

Table 3. Self-reported cholesterol intervention actions for three hypothetical patients at five cholesterol levels

Categories	Level 1	Level 2	Level 3	Level 4	Level 5
	Man, age 48 years				
Cholesterol (mg per dl)	188	210	234	258	276
Percentile elevation	25	50	75	90	99
Physician's treatment recommendation (percent):					
No action	95	64	27	5	2
Diet only	5	34	69	73	54
Diet and drug therapy	0	1	3	22	44
	Woman, age 53 years				
Cholesterol (mg per dl)	192	215	240	266	285
Percentile elevation	25	50	75	90	99
Physician's treatment recommendation (percent):					
No action	97	59	15	4	3
Diet only	3	41	80	72	52
Diet and drug therapy	0	0	5	23	45
	Man, age 26 years				
Cholesterol (mg per dl)	159	178	202	227	244
Percentile elevation	25	50	75	90	99
Physician's treatment recommendation (percent):					
No action	98	88	55	20	7
Diet only	2	12	45	71	68
Diet and drug therapy	0	0	0	8	25

Table 4. Physician factors associated with dietary treatment of a middle-aged man with a cholesterol level of 211 mg per dl

Physician factor	Relative risk	95 percent confidence interval, P<.05
Age (35 versus 55)	1.58	1.06–2.40
Eats low-fat diet	2.33	1.18–4.60
Had cholesterol checked	1.73	1.06–2.81

Table 5. Cases of elevated cholesterol observed in the community (1980–85) and patient reported use of lipid lowering drugs, 1986

Observed number of cases	Average cholesterol from 3 readings, 1980–85	Reported use of lipid lowering drugs, 1986
8 cases	>300	0
62 cases	>260	0
145 cases	>240	0

middle-aged female patient produced nearly identical results.

Lipid lowering drug use in the community. Table 5 presents the cholesterol levels recorded during examinations related to the FCP, and the lipid lowering drug use status of the patients. There was no detectable use of lipid lowering drugs among patients at any level of elevated cholesterol.

Discussion

The cholesterol levels for which respondents reported taking action were very similar to those in a recent national survey (*3*). Although many physicians report substantial activity aimed at cholesterol reduction, many do not report actions consistent with the guidelines suggested by the 1984 Consensus Conference, or the more recent recommendations of the Adult Treatment Panel of the National Cholesterol Education Program (*1,21*).

In this study, younger physicians were more likely to recommend diets for mild elevations of cholesterol. The physician's age was not, however, related to reported willingness to use cholesterol lowering drugs. Neither cholesterol-related knowledge nor expectation regarding the impact of reducing elevated cholesterol played an independent role in prediction of cholesterol lowering treatment practices. The lack of effects related to knowledge and outcome expectation effects may be the result of insufficient variance in these measures, or imprecision in their measurement. An equally plausible explanation is that values in the normal range of physicians' knowledge and outcome expectations are sufficient to stimulate a minimum level of preventive treatment, and beyond this level increases are unrelated to more aggressive treatment.

It is interesting that the physicians who themselves had a cholesterol measurement, and those who ate a low-fat, low-cholesterol diet were more likely to recommend such a diet to patients with modest elevations of cholesterol. These measures are an indirect but most likely robust measure of attitude toward and involvement with such a diet. Involvement with an issue has been postulated to alter a person's learning style in regards to that issue (*22*). The level of a physician's involvement may be an important parameter in the structure and outcome in educational programs.

As social learning theory suggests, perceived self-efficacy to use lipid lowering drugs predicted which physicians reported themselves to be the more aggressive prescribers. Perceived self-efficacy for dietary counseling, however, did not predict which physicians were more aggressive in recommending dietary changes. Although it is possible that prescribing behavior is somehow different from counseling behavior, we suspect that these inconsistent results are the result of a methodological problem in assessing the relationship between self-efficacy and behavior, using self-reported behavior based on a hypothetical patient. The act of writing a prescription is rather objective; it either occurs or it does not. Therefore, confidence in using pharmacological agents should predict self-reported prescribing behavior with considerable accuracy.

Dietary counseling is considerably less objective, however, in that it occurs in degrees. Two respondents, each of whom answered affirmatively that they would provide a hypothetical patient with dietary counseling, could in reality provide counseling that differs substantially on both qualitative (level of skill and effort) and quantitative (amount of time) dimensions. Therefore, due to this imprecision in the assessment of self-reported dietary counseling, there is little opportunity for the relationship between self-efficacy and behavior to be expressed.

The effects of practice location were investigated with the logistic regression models. Although the FCP intervention efforts did have an impact on the cardiovascular risk habits of the primary target audience—members of the general public (*23*)—it did not have a consistent effect on physicians' cholesterol lowering practices. Physicians in two of the cities tended to be more likely than the physi-

cians in the other two cities to prescribe dietary intervention for patients with modest cholesterol elevation and pharmacological intervention for patients with extreme elevations. These differences were not, however, associated with FCP intervention in that the more aggressive physicians practiced in one intervention and control city. Nor was it the case that the more aggressive physicians practiced among the more affluent and better educated populations.

Health service researchers have now documented rather large variations in physician treatment practices among similar cities in the same geographic areas for a host of medical and surgical conditions (*24*). This variability has not been explained by different rates of disease (*25*), and it has defied ready explanation (*26*). Preventive interventions may have similar variability.

Although this study is an investigation of physician characteristics that impact cholesterol intervention strategies, economic and organizational characteristics are also likely to play an important role. How they will influence cholesterol treatment is not entirely clear. In one study, physicians practicing in a health maintenance organization were more likely than physicians practicing in a fee-for-service setting to implement preventive practices (*27*). Another study indicated greater interest and preventive activity among physicians practicing in a fee-for-service setting (*28*), and a third study indicated no differences between practice settings (*29*). We did not collect any information on these factors; however, almost all the physicians in the communities surveyed were in fee-for-service practice settings at the time. Therefore, it is unlikely that payment status confounded the relationships found in this study.

This survey, like the previous national study, attempts to estimate cholesterol treatment practices by presenting physicians with hypothetical patients. The correlation between the response to such patients and actual clinical practice has been questioned (*30*). Although the respondents reported substantial prescribing of lipid lowering drugs, the lack of any visible use of such drugs in the community sample implies that self-reported and actual practice may be incongruous. Such incongruity is consistent with data indicating that physicians overestimate on questionnaires the amount of cancer screening that they actually perform (*31*).

Most previous surveys of physician practice inquired only about a hypothetical middle-aged male patient. In this study, we also presented a middle-aged female patient and a young adult male patient. The physicians seemed to be about equally aggressive in both middle-aged patients. Physicians were less likely to recommend a diet to the young patient who had a cholesterol in the 75th percentile for his age and sex than for the middle-aged patients. Cholesterol increases with age, so the 75th percentile for a 26-year-old, 202 mg per dl, is below the 50th percentile for a 48-year-old. It appears that physicians react more to an absolute number than to percentile.

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The 1984 Consensus Conference suggested treatment on the basis of age-specific percentile elevation (*21*). The 1988 Adult Treatment Panel, which was released after this survey, returned to absolute numbers for treatment thresholds (that would seem to have been wise) (*1*).

Even given the limitations of these data, it is clear that in 1986 the physicans in northern California were not as aggressive in treating elevated cholesterol values as current recommendations suggest that they should. The same situation probably exists nationally. During the last several years, the NCEP and others have made efforts to modify physicians' behavior, and these efforts are likely to be required for many years. Our data suggest that, when encouraging physicians to become more active in dietary treatment, attention should be paid to the their personal cognitions and behavior.

Our data also suggest that interventions to increase physicians' use of lipid lowering medications should contain components to build physician self-confidence in the use of these agents. The factors that limit physician self-efficacy in drug use may include their ability to manage the drugs, patient acceptance of the drugs, or lack of confidence in the drugs themselves. Further research is necessary to delineate this more fully, especially as newer drugs are introduced. The role of community factors in influencing the preventive practices of individual physicians appears important, but their extent and mechanism of action also requires additional investigation.

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