Physician awareness of elevated cholesterol

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Recent studies suggest a heightened awareness of the association between elevated cholesterol and heart disease. Physician awareness of an elevated cholesterol level was investigated at a university-affiliated, 200-bed community hospital. All cholesterol levels > 240 mg/dL on a multichemistry profile were evaluated regarding physician awareness. Criteria for awareness included any notation in the patient's chart indicating the physician's recognition of the abnormal cholesterol level or therapeutic intervention (dietary or pharmacologic). During March 1986, an awareness level of 20% was found. A similar review in March 1988 revealed no change despite a redefinition of the normal laboratory range of serum cholesterol from 133 to 298 mg/dL to 130 to 240 mg/dL.

On April 12, 1988, a 1-hour lecture sponsored by the Physician Cholesterol Education Program was presented at a hospital general staff meeting. Physician cholesterol awareness rose to 51.6% for the remainder of April through May 1988, and was 48.3% at 6-month post-CME follow-up. Chart reviews showed no heightened physician awareness related to the pa-

tient's age, sex, or diseases secondarily associated with increased cholesterol; however, increased physician awareness was associated with the primary diagnosis of atherosclerotic vascular disease and severity of hypercholesterolemia. Physician awareness of an elevated serum cholesterol level was poor during two retrospective prevalence surveys but improved considerably after delivery of an educational program.

High cholesterol levels have been associated with increased risk of cardiovascular morbidity and mortality,^{1,2} and the risk rises progressively with increasing levels.³ A growing number of studies⁴⁻⁸ suggest that lowering the blood cholesterol level will not only lower the risk of coronary disease, but it will also retard atherosclerotic progression in individuals with existing coronary disease. The 1988 report of the National Cholesterol Education Program's Expert Panel includes guidelines for the detection of high blood cholesterol in adults.⁹ These guidelines, formulated by a multidisciplinary panel, are designed to help physicians to identify adults at high risk for coronary artery disease.

It is estimated that as many as 40 million Americans may enter the healthcare system for treatment of elevated cholesterol if these guidelines are followed. These guidelines are based on calculated low-density lipoprotein (LDL) cholesterol levels; however, a screening measurement of total serum cholesterol is the

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initial step. A serum cholesterol level of ≥ 240 mg/dL is considered high in the adult population.⁹ For clinical efficacy, it is essential for physicians to become familiar with these guidelines and recommended therapeutic interventions.^{10,11}

In our study, physician awareness of a screening cholesterol level of ≥ 240 mg/dL was investigated at a 200-bed university-affiliated community hospital. The primary objectives of this study were to (1) determine the level of physician recognition of elevated cholesterol in a typical hospital population; (2) determine the effect of a change in the upper limit of normal cholesterol used on laboratory reporting forms on the recognition by physicians of elevated cholesterol in their patients; (3) determine the immediate and 6-month follow-up effects of a hospital-sponsored lecture on cholesterol awareness on the physicians' recognition of elevated cholesterol levels in their patients; and (4) determine if patient age, sex, severity of elevated cholesterol, or primary diagnosis predisposes the physician to respond to an elevated cholesterol level.

Patients and methods

Physicians' clinical responses to hospital patients' elevated cholesterol levels were assessed before and after (1) redefining the clinically normal range of serum cholesterol on laboratory report forms and then (2) presenting a continuing medical education (CME) lecture on hypercholesterolemia.

A study population of 402 inpatients at Fort Worth (Texas) Osteopathic Medical Center was drawn from a review of approximately 3400 charts. All cholesterol levels > 240 mg/dL during the months of March 1986 and March, April, May, October, and November 1988 were examined for inclusion in the study population. The cholesterol measurements were obtained from a screening multichemistry profile by use of a Beckman Astra Analyzer. Patients were excluded from review if their diagnosis included terminal disease state or severe dementia, or if they were in "do not resuscitate" status. Cholesterol measurements of 502 patients from March 1986 were reviewed, with 92 meeting criteria; 742 chole-

sterol measurements from March to April 12, 1988, were reviewed, with 97 meeting criteria; 800 cholesterol measurements from April 12 through May 25, 1988, were reviewed, with 91 meeting criteria; and 1355 cholesterol measurements from October and November 1988 were reviewed, with 122 meeting criteria.

The laboratory form in March 1986 reported as normal serum cholesterol levels in the range from 133 to 298 mg/dL. Patients' charts that met inclusion criteria during this period provided preintervention data. In late March 1988, the hospital laboratory form was changed to indicate a redefinition of the normal range for serum cholesterol from 133 to 298 mg/dL to a range of 130 to 240 mg/dL. Of the 97 subjects reviewed during March and early April 1988, 48 had laboratory reports using 298 mg/dL as the upper limit of normal, while 49 had forms using 240 mg/dL as the upper limit of normal. This change in the laboratory form's definition of normal served as the first intervention.

A 1-hour lecture sponsored by the National Cholesterol Education Task Force was given to the medical staff on April 12, 1988. This educational program reviewed risks of cardiovascular morbidity and mortality and the National Cholesterol Education Program Expert Panel's published guidelines for the detection of high blood cholesterol in adults. Also presented during the program were national levels of physician awareness of elevated cholesterol as well as comparable levels of awareness observed at the hospital in this study. This CME program constituted the second intervention. Patient data from chart reviews from October and November 1988 served as 6-month post-CME follow-up data.

Criteria for awareness included any notation in the chart indicating the physician's recognition of the abnormal cholesterol level or any recommendation for therapeutic intervention (dietary or pharmacologic). Data were collected to compare the level of physician awareness from 1986 to 1988 before and after the laboratory's change in definition of normal cholesterol values, as well as before and after the CME lecture (immediate and follow-up). Chart data were reviewed to see if a heightened aware-

ness of an increased cholesterol level was related to the patient's age, sex, severity of elevated cholesterol, and history of atherosclerotic disease, diabetes, hypothyroidism, or nephrotic syndrome.

All percentages were compared by use of the method of Bruning and Kintz.¹² Each comparison yielded a *z* score, which was compared with the normal distribution using a two-tailed test of significance. An α level of .05 was adopted as the level of significance.

Results

Physician awareness of elevated cholesterol was 19.6% in March 1986 (Figure). Prior to the laboratory's changing the upper limit of normal value from 298 mg/dL to 240 mg/dL, data from March 1988 revealed a physician awareness level of 22.9%. In mid-March, a new upper limit normal of 240 mg/dL was instituted for cholesterol, and the level of aware-

ness from this date through April 12 was 20.4%. On April 12, 1988, the CME lecture was presented at a hospital general staff meeting. Physician cholesterol awareness for the remainder of April through May 25 was 51.6% (significantly different from all other pre-CME times, $P < .01$). In addition, at the 6-month follow-up assessment, physician cholesterol awareness had held steady at 48.3% (significantly different from all other pre-CME times, $P < .01$, and not significantly different from the preliminary post CME-data from April and May 1988).

Overall, physician awareness of elevated cholesterol levels was observed in 145 of 402 cases (36.1%). Data comparing physician awareness of elevated cholesterol in relation to the patient's sex, age, severity of cholesterolemia, and primary diagnoses are outlined in the Table. No statistically significant difference was found for patient sex compared with physician

Figure. Physician awareness of elevated cholesterol. *Significantly different from each and all pre-CME times ($P < .01$).

Table
Comparison of Physician Awareness of Elevated Cholesterol by
Patient's Sex, Age, Severity, and Primary Diagnosis

Variable	No. of cases	No. with noted cholesterol	Physician awareness, %
Sex			
Male	146	45	30.8
Female	256	100	39.0
Age			
≤ 49	163	57	34.9
50-64	110	47	42.7
≥ 65	129	41	31.7
Severity			
240-297 mg/dL	312	99	31.7*
≥ 298 mg/dL	90	46	51.1*
Diagnosis			
ASVD†	107	47	43.9‡
Diabetes	66	25	37.8
All others	229	73	31.8‡
TOTALS			
All cases	402	145	36.1

*Significantly different from each other ($P < .01$).

† ASVD = atherosclerotic vascular disease.

‡ Significantly different from each other ($P < .05$).

cholesterol awareness observed in 45 of 146 men (30.8%) and 100 of 256 women (39.0%). In addition, no significant differences were identified for age when analyzed by the following categories: (1) 49 years old and younger (57 of 163 cases, 34.9% awareness); (2) 50 to 64 years old (47 of 110 cases, 42.7% awareness); and (3) 65 years old and older (41 of 129 cases, 31.7% awareness).

Analysis of physician awareness of elevated cholesterol by severity of hypercholesterolemia (240-297 mg/dL vs ≥ 298 mg/dL) revealed a statistically significant difference ($P < .01$). For the 312 patients with cholesterol levels in the range of 240 to 297 mg/dL, 99 cases (31.7%) had elevated cholesterol noted in their charts. In comparison, 51.1% of patients (46 of 90 cases) with cholesterol levels ≥ 298 mg/dL had such a notation.

Physician awareness of elevated cholesterol was also examined in regard to differing primary diagnoses of atherosclerotic vascular dis-

ease (ASVD), diabetes mellitus, hypothyroidism, and nephrotic syndrome. Insufficient numbers of cases prohibited meaningful analyses regarding the primary diagnoses of hypothyroidism and nephrotic syndrome. Cholesterol was noted in the charts of 25 of 66 patients (37.8%) with the primary diagnosis of diabetes mellitus, but this was not significantly different from all remaining cases other than diabetes and ASVD (73 of 229 cases, 31.8%). However, in 47 of 107 ASVD cases (43.9%), the physician indicated awareness of elevated cholesterol. This percentage was significantly greater than all remaining cases other than ASVD and diabetes ($P < .05$).

Discussion

Initially, overall physician awareness and clinical response to elevated cholesterol levels were low. Changing what was defined as the abnormally elevated cholesterol level had minimal impact on physician awareness; however, a

CME lecture on the recognition and treatment of elevated cholesterol significantly increased physician awareness. Six-month post-CME follow-up indicated no significant decline in overall level of physician response to hypercholesterolemia.

The patient's age and sex had no significant impact on physician clinical response. However, greater physician awareness of elevated cholesterol was observed in relation to increased severity of hypercholesterolemia. Diagnoses related to atherosclerosis were significantly associated with increased physician clinical response. Although diabetes mellitus is a concurrent cardiovascular risk factor, its presence as a primary diagnosis did not affect physician clinical response to elevated cholesterol levels. It is particularly important to observe that even after CME efforts, only about half of the patients with a cholesterol level > 240 mg/dL had any notation in their charts that indicated physician awareness of an elevated cholesterol level.

The baseline survey in 1986 was conducted after the Consensus Conference by the National Institutes of Health on Lowering Blood Cholesterol⁶ as well as from the Lipid Research Clinics (LRC) Coronary Primary Prevention Trial (CPPT)⁷ that linked the reduction in serum cholesterol with the reduction in incidence of fatal and nonfatal coronary events. The second screening period in 1988 was conducted after the Report of the National Cholesterol Education Program Expert Panel,⁹ which modified the earlier recommendations.

Two additional studies in 1987, the Helsinki Heart Study¹³ and the Cholesterol Lowering Atherosclerosis Study (CLAS),⁵ also confirmed the beneficial effect of lowering the serum cholesterol level in the treatment of coronary heart disease. It is apparent that this new information did not change overall physician awareness of an isolated elevated cholesterol level. This awareness also was not affected by a change in the definition of high cholesterol from > 298 mg/dL to > 240 mg/dL, which occurred in mid-March 1988.

Recent studies have shown that there is an increasing awareness of elevated cholesterol levels from both the public¹⁴ and the physi-

cian perspective.¹⁵ In a study sponsored by the National Heart, Lung and Blood Institute,¹⁵ 64% of practicing physicians surveyed nationally via telephone in 1986 thought that a reduction of blood cholesterol levels would reduce coronary artery disease compared with 39% of physicians surveyed in 1983. In several studies examining cholesterol awareness in a family practice residency program, the level of awareness ranged from 5% to 8%.¹⁶⁻¹⁸

In another study screening New York metropolitan area residents for elevated serum cholesterol,¹⁰ no action was recommended in the majority of cases in which an elevated level was noted and the patient's physician was consulted for advice. One study¹⁹ showed that even among patients hospitalized for coronary heart disease before age 60 years, a lipid profile had been ordered for only 18%. Also, only 53% of these patients had any notation of the presence or absence of a lipid abnormality in their charts, as compared with 44% of patients in our study, which incorporated the diagnosis of atherosclerotic disease under the coronary artery disease classification.

The San Antonio Heart Study²⁰ not only revealed a low level of awareness (7%-17%) of elevated cholesterol, but it also found that only 24% to 27% received any therapy, and effective control was achieved in only 39% to 41% of those receiving therapy. Our study demonstrated a similarly low level of physician awareness of an elevated cholesterol level.

As previously noted, other studies^{19,21} report that the diagnosis of associated atherosclerotic disease does not appear to increase the likelihood of a physician's awareness of an elevated cholesterol level, even when the cholesterol level is markedly elevated (> 350 mg/dL).²² In contrast, our present study indicated that greater elevated cholesterol levels were associated with increased physician awareness. It appears, however, that a diagnosis of diabetes does not have the same impact. Although the American Diabetes Association (ADA) currently recommends a diet low in cholesterol and saturated fats aimed at reducing the serum cholesterol level, this recommendation frequently is not followed.

In addition, a 1987 Consensus Development

Conference on Diet and Exercise in non-insulin-dependent diabetes mellitus²³ raised doubts about recommending high-carbohydrate/low-fat diets to all patients with diabetes. In fact, several studies^{24,25} suggest that certain diets recommended by the ADA may have a potentially harmful effect on lipoprotein levels. Therefore, the degree of awareness of an elevated cholesterol level should be heightened rather than decreased when such an elevation is associated with diabetes mellitus. One may assume that physicians frequently consider dietary and pharmacologic intervention for diabetes sufficient to resolve the cholesterol abnormality.

Finally, the marked increase in physician awareness after a 1-hour lecture sponsored by the Physician Cholesterol Education Program did not decay significantly at a 6-month follow-up evaluation. The increased awareness of the immediate post-CME period did decrease slightly at 6-month follow-up, and further evaluation is needed to determine if the increased awareness would hold steady at higher levels, rather than returning to baseline values, over a longer follow-up period.

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