

Serum Cholesterol: Attitudes and Behavior of Family Practice Residents

Robert B. Kelly, MD, Oscar Velez-Holvino, MD, and Sonia A. Alemagno, PhD
Stony Brook, New York, and Cleveland, Ohio

Background. Given the current health promotion efforts regarding coronary artery disease, more information is needed about residents' attitudes and behaviors that relate to identification and management of patients with elevated serum cholesterol levels.

Methods. Family practice residents from eight US programs (N = 128) were surveyed in 1989 to assess their attitudes and reported practice patterns. Resident survey data were compared, when feasible, to published data from 1986 and 1990 surveys of practicing physicians performed by the National Heart, Lung, and Blood Institute.

Results. The use of faculty "key contacts" resulted in a 90% response rate (N = 115). Both residents and practicing physicians attributed a high degree of importance to cholesterol as a risk factor. Residents reported more frequent routine screening of middle-aged men than the routine screening rate of practicing physicians in 1986 ($P < .01$). Residents reported less frequent screening of younger and older adults than of

middle-aged men ($P < .001$). Residents' threshold for the use of cholesterol-lowering medication was lower than that of practicing physicians surveyed in 1986, but higher than that of physicians surveyed in 1990. Compared with practicing physicians, residents did not believe they were as well prepared to counsel patients about dietary change or as successful when they tried to help patients make changes; residents reported a significantly higher rate of referral to dietitians ($P < .01$).

Conclusions. Residents may need more education regarding screening guidelines for children and young adults. A health promotion skills gap may exist that explains reported discrepancies between self-report and actual behavior and indicates that residency educators may need to pay more attention to fostering dietary assessment and counseling skills in their residents.

Key words. Cholesterol; education, medical, graduate; attitude of health personnel. *J Fam Pract* 1991; 33:259-265.

There has been an increasing recognition of the prevalence and importance of blood cholesterol as a risk factor for heart disease.¹⁻³ In 1985 a consensus conference sponsored by the National Institutes of Health (NIH) published new recommendations for the screening for and treatment of elevated blood cholesterol.⁴ Dissemination of these new guidelines has been facilitated by the establishment of the National Cholesterol Education Program, sponsored by the National Heart, Lung, and Blood Institute (NHLBI), as well as other national programs such as the Physicians' Cholesterol Education Program of the American Heart Association.

While the new guidelines have not been accepted without controversy,^{5,6} if the NIH Consensus Panel recommendations are followed, it can be estimated that approximately one in four adult Americans will be identified as "at risk" of developing heart disease because of elevated blood cholesterol. After a trial of dietary modification, many in this at-risk group will be offered cholesterol-lowering medications. The implementation of the guidelines, therefore, has many implications for primary care practice and raises many as yet unanswered questions. For example, are physicians in primary care willing and able to provide or arrange for dietary counseling? Will patients attach enough importance to blood cholesterol as a risk factor to comply with physicians' recommendations?

Practicing physicians' attitudes and skills, as well as the public's beliefs and knowledge, are a critical aspect of cholesterol control. In order to assess changing public and physician opinions, two national surveys were con-

Submitted, revised, June 11, 1991.

From the Department of Family Medicine, State University of New York at Stony Brook; and the Department of Family Practice, Fairview General Hospital, and the Department of Family Practice, Case Western Reserve University, Cleveland, Ohio. Requests for reprints should be addressed to Robert B. Kelly, MD, Department of Family Medicine, Health Sciences Center-SUNY, Stony Brook, NY 11794.

ducted in 1983 and 1986 by the NHLBI.^{7,8} These physician surveys, as well as others,^{9,10} revealed an increasing awareness of the importance of elevated cholesterol as a risk factor as well as a heightened belief that reducing high blood cholesterol levels will lead to a reduction in heart disease. These attitudinal changes were reflected in changing self-reported practice patterns, such as reduced thresholds for initiating dietary or pharmaceutical treatment. Half of the physicians in the 1986 NHLBI survey,⁸ however, still reported they would not initiate diet therapy at a serum cholesterol level of 6.21 to 6.71 mmol/L (240 to 259 mg/dL). A survey of San Francisco Bay area physicians conducted in 1985 noted similar findings.⁶ In a 1986 survey of New Hampshire primary care physicians, over 40% believed that cholesterol needed to be 7.8 mmol/L (300 mg/dL) or greater to constitute a high risk for coronary heart disease for patients aged 40 to 59 years.¹¹ This survey also indicated that physicians believed they were less effective in managing lipid abnormalities than in managing hypertension. Quite recently, some data from a 1990 NHLBI survey, similar in content and design to the 1983 and 1986 surveys, have been reported.¹² In this survey, physicians reported lower thresholds for treatment of elevated serum cholesterol than in 1986. In addition, there were fewer differences among reported behaviors of cardiologists, internists, and family or general practitioners. The survey also highlighted areas of continuing challenge, however, especially related to dietary counseling by physicians or other providers. In summary, while attitudes of practicing physicians, at least in the United States, seem to be moving toward concordance with the Consensus Panel guidelines, substantial efforts are still needed to help physicians feel more effective and be more effective in the management of elevated serum cholesterol.

It is possible that physicians in training may have attitudes similar to those of practicing physicians concerning blood cholesterol as a risk factor; however, there have been few studies addressing this question. One recently reported study of attitudes and practices was conducted in 1987 using 114 University of Wisconsin-affiliated family practice and internal medicine residents.¹³ This survey showed that residents in that system had attitudes that were reflective of the guidelines of the National Cholesterol Education Program. This is an encouraging finding, but may not generalize nationally, as the overall response rate was only 57%, and local bias toward more intensive education of residents in preventive cardiology was not excluded. Despite the favorable attitudinal findings, however, audits of the residents' actual practice showed that they were not providing care that approximated their own recommendations for the management of hypercholesterolemia. Other studies of

the actual practice behaviors of residents lend support to this finding.¹⁴⁻¹⁷ While it is not yet clear what the barriers are to better preventive practice in the area of serum cholesterol risk, it is clear that it will be important to find ways to help resident physicians bridge the gap between good intentions and actual practice behavior.

The goal of the present study was to develop more information on residents' attitudes and behaviors that relate to serum cholesterol as a risk factor. There were four principal research questions:

1. What risk factors for heart disease are seen as most critical by residents?
2. What are resident attitudes about cholesterol measurement, management, and patient compliance?
3. Are there attitudes or self-assessed competencies that might represent barriers or aids to effective patient management?
4. In comparing the findings to published data from the NHLBI physician surveys, what differences exist between residents and physicians in practice? Practicing physicians were chosen as a comparison group, since no appropriate data was available for residents at the time of study design and data analysis.

Because of the timing of the surveys, it was hypothesized that residents would report screening for and treatment of elevated blood cholesterol more often than practicing physicians surveyed in 1986. Given the inclusion of nutrition curricula and counseling instruction in most family practice programs, it was also hypothesized that residents would feel more capable of performing dietary counseling than many physicians in practice, who were not likely to have had nutrition curricula in their training.

Methods

Surveys of physicians tend to be plagued by relatively low response rates.¹⁸ To address this concern, a nonrandom selection strategy was designed to increase the response rate over what could be expected in a mailed survey to a random sample of residents or programs. Through telephone contacts with colleagues, one investigator (R.B.K.) identified individual "key contact" faculty in eight family practice residency programs, in which 128 residents were in training in aggregate. At each program, the key contact faculty member agreed to distribute and collect questionnaires from residents at their site. The sample size was chosen to control for between-program variability and to provide enough residents to test for moderate to large group differences statistically. Four of the programs were university hospital-based; the re-

remaining four were community hospital-based (one university-administered; two university-affiliated; one unaffiliated). The programs were chosen to represent different regions of the United States. They were located in Columbia, Missouri; Eau Claire, Wisconsin; Greensboro, North Carolina; Iowa City, Iowa; San Diego, California; Shreveport, Louisiana; Washington, Pennsylvania; and Youngstown, Ohio.

A 4-page questionnaire was designed to address the research questions (copy available on request from the authors). The majority of the items were drawn from the previously validated 1986 NHLBI survey of practicing physicians, in order to improve reliability and validity of the data obtained, and to allow for comparisons with published data from these surveys. Additional questionnaire items were designed as needed to address the research questions and study hypotheses. Demographic questions and relevant personal and family medical history were also included. The entire questionnaire, including the previously validated portions, was reviewed by a panel of research staff and faculty physicians, and the instrument was pretested using family practice residents of the investigators' own program (R.B.K., O.V.H.), which was excluded from the study to avoid bias.

Surveys were mailed to key contact faculty in January of 1989. Data from the returned survey questionnaires were coded, keypunched, and entered into an Apple Macintosh SE microcomputer. The SYSTAT statistical software package (SYSTAT, Inc. Evanston, Illinois)¹⁹ was used for the majority of data tabulation and analysis. Descriptive research questions were assessed by frequency tabulation, ranking of categorical responses, or calculation of mean scores for scaled responses. Apparent differences between subgroups of residents were evaluated by chi-square tests on two-by-two tables. Comparisons between resident responses and practitioner data were tested statistically as a difference between proportions of independent samples. In this case, a *z* value was calculated by dividing the difference in proportions by the standard error of the difference (for $z > 1.96$, $P < .05$; for $z > 2.58$, $P < .01$ for a two-tailed test). Whenever feasible, data specific to practicing general and family physicians were used rather than the entire sample of the 1986 or 1990 NHLBI survey.

Results

The use of faculty key contacts resulted in the return of 115 completed questionnaires out of a possible 128, for a response rate of 90%. The mean age of the respondents was 30 years; 71 (62%) were male. Twenty-eight respondents (24%) were first-year residents; 48 (42%)

Table 1. Ranking of Heart Disease Risk Factors by Residents and Practicing Physicians

Risk Factor	Residents (N=115)		Practicing Physicians* in 1986 (N=1277)	
	Mean Score† ± SD	Rank	Indicated Large Effect on Risk (%)	Rank
Cigarette smoking	9.4 ± 1.0	1	93	1
High blood pressure	8.9 ± 1.1	2	79	2
High cholesterol	8.8 ± 1.3	3	64	3
High fat diet	7.1 ± 1.8	4	40	5
Overweight	6.9 ± 2.0	5	31	6
Sedentary lifestyle	6.4 ± 2.0	6	14	8
Stress	5.9 ± 1.8	7	18	7
Elevated triglycerides	5.9 ± 2.6	8	43	4
Type A personality	5.2 ± 2.1	9	11	9

*Data for practicing physicians abstracted from Schucker et al. JAMA 1987; 258: 3521.

†Residents' mean score on scale from 1 (little effect on risk) to 10 (large effect on risk). SD denotes standard deviation.

were second-year residents, and 39 (34%) were third-year residents. Twenty-six percent indicated that they had a family history of high blood cholesterol; 17% indicated a personal history of elevated cholesterol.

Residents were asked to rate what effect reducing nine potential heart disease risk factors would have on a patient's risk for coronary heart disease, on a scale from 1 (indicating little effect on risk) to 10 (indicating large effect on risk). In Table 1, the mean ratings for the risk factors are given, ranked in order of importance as perceived by the residents. It appears that risk factor scores clustered in three groups. Residents thought that cigarette smoking, high blood pressure, and high cholesterol had the greatest impact on risk. Stress, elevated triglycerides, and type A personality were perceived to affect risk only moderately. Having a high fat diet, being overweight, or having a sedentary lifestyle were scored between these two extremes. Residents' rating scores were examined for any differences by program, year of residency, family or personal history of high cholesterol, or sex. No statistically significant differences in mean scores were found, although residents with a family or personal history of high cholesterol did rank cholesterol (mean score 8.7) above high blood pressure (mean score 8.5).

For comparison purposes, Table 1 also includes a ranking of practicing physicians' perceptions of the same risk factors, drawn from the 1986 NHLBI survey (ranked by the frequency with which they thought that reducing a given risk factor would have a "large" effect on patients' coronary risk). The rankings by residents and practicing physicians when compared this way are similar; the top three risk factors are identically ordered: cigarette smoking, hypertension, and elevated blood cholesterol. The only notable difference was for elevated

Table 2. Attitudes of Residents and Practicing Physicians Toward Diet, Cholesterol, and Counseling

Attitude Statement	Residents (N=115)		Practicing Physicians* in 1986 (N=1277)	
	Strongly Agree, %	Agree, %	Strongly Agree, %	Agree, %
"Typical American diet contains too much fat"	88	12	78	21
"Serum cholesterol levels in American adult males are too high for good health"	56	40	60	35
"I feel prepared to diet counsel patient to lower serum cholesterol" [†]	20	60	58	33
"I am successful in helping patients change diet to lower serum cholesterol" [†]	4	54	15	58
"Serum cholesterol of children with parents with elevated cholesterol should be measured" [†]	30	45	59	28
"Patients don't really want to change diets"	4	54	23	35

*Data for practicing physicians abstracted from Schucker et al. JAMA 1987; 258: 3521.

[†]Residents differed significantly from practicing physicians, $P < .01$ by test of z value.

triglycerides, which was ranked much higher by practicing physicians (fourth) than residents (eighth).

Residents were also asked to indicate their agreement on a 5-point scale with a number of statements about diet, cholesterol, and counseling dietary change. In Table 2, the statements and the residents' responses (in the categories "agree" and "strongly agree" only) are summarized and contrasted to those of practicing physicians surveyed in 1986. Similar data for 1990 practicing physicians are not yet published. For analysis, "agree" and "strongly agree" response categories were combined for each item. Residents believed they were less well prepared to counsel their patients about diet ($z = 3.8$; $P < .01$) and less successful in helping patients change their diets ($z = 3.4$; $P < .01$) compared with practicing physicians. When resident subgroups were compared, there was a significant trend toward higher preparation to counsel ($\chi^2 = 5.7$; $P < .02$) and success in helping patients change ($\chi^2 = 4.5$; $P < .05$) in more senior residents compared with first-year residents. However, although third-year residents felt almost as well prepared to counsel patients as practicing physicians (87% "agree" or "strongly agree", $z = .8$, $P > .1$), they did not feel as successful (60% "agree" or "strongly agree", $z = 2.2$, $P < .05$). If only the "strongly agree" response category is contrasted to others, residents feel less strongly than practicing physicians that patients' reluctance to change

Table 3. Percent of Residents Who Reported Cholesterol Screening, by Resident Training Level and Medical History

Types of Patients	Resident Level			Resident's Family or Personal History of High Cholesterol	
	1st Year	2nd Year	3rd Year	Negative	Positive
Patients 20 to 40 years old	63*	79	85	72	88
Men 40 to 60 years old with no evidence of CVD or diabetes [†]	89	98	97	94	100
Patients 60 years and older	65	77	87	72	92 [‡]

*First-year residents differed significantly from senior residents in screening young patients, $P < .05$.

[†]Residents were more likely to screen 40- to 60-year-old men than younger or older patients, $P < .001$.

[‡]Residents with positive histories were more likely to screen older patients, $P < .001$, chi-square tests. CVD denotes cardiovascular disease.

their diet is an obstacle to successful intervention ($z = 4.8$; $P < .01$).

In the next section of the survey, residents were asked about routine screening of blood cholesterol in three types of patients: 20-to-40-year-olds of both sexes, men 40 to 60 years old with no evidence of heart disease or diabetes, and those 60 years of age and older of both sexes. The frequencies with which residents would screen these groups are shown in Table 3, with reference to residents' level of training and personal or family history of high cholesterol. Almost all residents indicated that they would routinely screen men 40 to 60 years old; the percentage was significantly higher than that of practicing physicians in 1986 (96% vs 87%, $z = 4.3$; $P < .01$; data not available for 1990 survey). On the other hand, residents were less likely than practicing physicians to agree that screening should be done for children of parents with elevated cholesterols ($z = 3.6$; $P < .01$; Table 2). As shown in Table 3, residents were less likely to report routine screening in younger (20 to 40 years old) and older (over 60 years old) men and women than in middle-aged men ($\chi^2 = 17.6$; $P < .001$). Two subgroup trends were found as well. Senior residents were more likely to report routine screening of blood cholesterol than first-year residents for all patient age groups; this difference reached statistical significance for younger patients ($\chi^2 = 3.9$; $P < .05$). Residents with positive personal or family histories of high cholesterol were more likely to report screening than those with negative histories; these differences were statistically significant for screening of older adults ($\chi^2 = 14.1$; $P < .001$) and approached significance for younger adults ($\chi^2 = 3.5$; $P = .06$).

Respondents were asked to indicate their threshold for instituting drug therapy, either after a trial of diet modification had failed or without waiting for a trial of

Table 4. Threshold for Initiation of Drug Therapy

Cholesterol Level	If Trial of Diet Has Failed			Without Waiting for a Trial of Diet
	GP/FP* in 1986 (N=631), %	GP/FP† in 1990 (N=805), %	Residents (N=115), %	Residents (N=115), %
less than 6.72 mmol/L (\leq 260 mg/dL)	20	74	53	3.5
6.72 to 7.21 mmol/L (260-279 mg/dL)	3	5	18	3.5
7.24 to 8.79 mmol/L (280-339 mg/dL)	33	13	23	32
More than 8.79 mmol/L (\geq 340 mg/dL)	28	1	2.6	57
Would never use drug therapy	16	2	4.3	4.3

*Data for general and family physicians abstracted from Schucker et al. *JAMA* 1987; 258:3521.

†Data for general and family physicians abstracted from Schucker et al. *Arch Intern Med* 1991; 151:666-73.

GP/FP denotes physicians in general practice and in family practice.

diet modification. Only 4.3% indicated that they would never use drug therapy. Twenty-three percent would use a drug even at a level of cholesterol below 6.21 mmol/L (240 mg/dL) if diet modification did not work. Appropriately, the majority (81%) would not start a medication without a trial intervention of dietary modification unless serum cholesterol were at least above 7.76 mmol/L (300 mg/dL), a level at which one could reasonably expect that diet alone would not result in the desired reduction. Table 4 contrasts resident responses with those of practicing physicians.* In comparison with practicing physicians from the 1986 NHLBI survey, residents reported a lower threshold for drug therapy. As an example, 71% of residents, compared with 23% of practicing general and family physicians, would institute drug therapy at some level of cholesterol below 7.24 mmol/L (280 mg/dL) when diet failed ($z = 10.3$; $P < .01$). Practicing physicians in the 1990 NHLBI survey had a lower threshold for treatment than residents. As an example, for levels of cholesterol less than 6.72 mmol/L (\leq 260 mg/dL), 74% of physicians versus 53% of residents would begin therapy ($z = 4.7$; $P < .01$) when diet modification failed.

When asked which drugs they "commonly" prescribed, residents primarily reported use of cholestyramine (53%), nicotinic acid (47%), lovastatin (43%), or gemfibrozil (24%). Less than 10% of residents indicated that they commonly prescribed probucol, colestipol, clofibrate, or psyllium fiber. When compared with practicing physicians, residents reported significantly more use of cholestyramine and nicotinic acid, significantly less use of probucol and clofibrate ($z > 2.6$; $P < .01$), and a trend toward less use of gemfibrozil ($z > 1.7$; $P < .1$). Physicians in the 1990 NHLBI survey reported prescribing practices that were similar to those of residents, though they used lovastatin even more frequently (53%, $z = 2.0$; $P < .05$).

The last section of the questionnaire dealt with

issues of patient education and compliance. The majority of residents (83%) indicated that they "always" or "usually" use educational materials in helping patients make dietary changes. Practicing physicians in 1990 reported a similar use of materials (89%). Residents commonly refer patients for nutritional counseling (65% always or usually). This was a significantly higher rate of referral than for practicing physicians (27% in 1990 survey, $z = 8.9$; $P < .01$). Residents who seldom or never referred patients generally either believed that counseling was too expensive (46%), did the counseling themselves (36%), or reserved referral for the most extreme cases (26%). Residents less commonly used educational materials when starting medication (52% always or usually). Those who did not tended to blame a lack of available materials (69%) or believed that they provided adequate education themselves (33%).

Residents were also asked to rate potential obstacles to compliance with dietary changes and medication regimens on a scale from 1 (not a problem) to 10 (major problem). For diet compliance, the obstacles receiving the highest mean rating scores were the restriction of favorite foods (mean = 8.2), difficulty with finding appropriate meals away from home (mean = 7.8), and eating differently from other family members (mean = 7.7). For medication compliance, cost received the highest score (mean = 8.2), followed by side effects (mean = 7.5). Notably, patient denial of the importance of lowering cholesterol received the lowest mean score in both sets of questions (mean = 5.4).

Discussion

The success of using faculty key contacts was amply demonstrated by the high response rate. This strategy addresses the problematic responder bias that would have occurred in a random sample of residents with a lower response rate. At the same time, this was not truly a national study, but rather a "multi-center" study. This makes it impossible to exclude a bias related to the faculty

*Figures and cholesterol level increments shown on Table 4 differ from figures in the text, reflecting adjustment to permit comparison with physician surveys.^{8,12}

of the eight chosen programs teaching in some manner that varies from the average about cholesterol screening and treatment.

A limitation of the data from the survey is that they are derived from self-report only. They have been contrasted primarily with self-report data from practitioners, which is probably appropriate, and may provide valid insights into differences between residents' and practitioners' opinions and into areas of residency education that may need bolstering. Given reported discrepancies between reported and actual cholesterol management behaviors,¹³ however, the data cannot be used to accurately estimate actual practice behaviors.

Residents' rankings of risk factors were similar to practicing physicians' with the exception of triglycerides (ranked fourth by practicing physicians in 1986 and eighth by residents). This finding could be interpreted to mean that residents have a more current understanding of the importance of elevated triglycerides to overall risk. It is clear, however, that both groups believe that elevated blood cholesterol is an important risk factor for heart disease.

A finding of concern was the residents' lower reported preparation to counsel patients about diet and lower reported success in helping patients make dietary changes compared with practicing physicians. This finding runs counter to the study hypothesis that residents would have greater skills in this area. This was believed to be because counseling, nutrition, and patient education curricula are included in many residencies, whereas most practicing physicians have had no formal training in these areas. It is not clear what this finding truly signifies, but there are at least four interpretations: (1) practicing physicians develop these skills as they gain practice experience; (2) practicing physicians overrate or residents underrate their level of skill; (3) practicing physicians' higher continuity with patients makes them more successful; or (4) residency faculty are not imparting these skills to residents as well as they might. In generating our initial hypothesis, perhaps we overestimated the effectiveness of nutrition curricula in current residency training. It is certainly true that teaching physicians to counsel effectively is a challenging task. Senior residents reported better preparation for counseling and success in fostering dietary change, indicating a positive impact of residency training.

Practicing physicians were more likely than residents to strongly agree that patients do not really want to change their diets. Residents may believe they are less successful because they are not as well prepared as they would like to be, whereas practicing physicians may put more blame on patient factors when nutrition counseling is not successful. This whole area of health promotion

and patient education skills is one that deserves further study, since physicians often perceive themselves as "least skilled in enhancing patient compliance and achieving behavior change."²⁰ Physicians who do not believe they are prepared to counsel patients or that they are successful when they do are probably less likely to try, even when they know it is recommended and would agree that it is important. This "health promotion skills gap" represents a great barrier to effective disease prevention and could explain some of the reported discrepancies between self-report and actual behaviors.¹³

A second area of concern about residents' attitudes relates to cholesterol screening practices. On the positive side, residents reported significantly more routine screening of middle-aged men than did practicing physicians in 1986. Residents were significantly less likely to agree, however, that children of hypercholesterolemic parents should be screened for elevated blood cholesterol. Despite recommendations for this practice,²¹ and even more recent suggestions that all children should be screened,^{22,23} there is not yet a clear consensus about the role of cholesterol screening of children. Residents' attitudes may reflect some of this uncertainty, may be due to a simple knowledge deficit, or may represent something more complex. In any case, there was replication of the finding in the sense that residents' reported screening behaviors for younger adults, aged 20 to 40 years, was significantly lower than their rate of screening middle-aged men. This apparent relative reluctance to screen young adults is clearly a problem that needs to be addressed educationally with residents. In contrast, the rationale for screening older adults is not as well defended by existing literature as that for young and middle-aged adults.²⁴ This may be reflected in the residents' decreased reported rate of routine screening of patients 60 years old and older. Observed differences between first-year residents and senior residents are of less concern than the differences by patient age, since the trend was clearly that there was more frequent screening by senior residents in all three patient age groups. This change in practice pattern can probably be attributed to the impact of residency training on outpatient health maintenance skills.

In terms of the use of medication, residents' threshold for treatment was somewhat higher than that of physicians surveyed in 1990, but quite a bit lower than that of physicians surveyed in 1986. This finding most likely reflects the rapid changes in physician attitudes and reported practices documented by the NHLBI surveys. For residents, one can wonder whether this behavior pattern represents early adoption of new therapeutic approaches or an overcompensation for underdeveloped counseling skills.

In terms of the choice of medications, it was impressive to note the "common" reported prescription of lovastatin, a newer medication, by 43% of residents. Other than lovastatin, the top three resident choices were the same as those for practicing physicians, and ranked in order of frequency identically to those chosen by cardiologists in the 1986 NHLBI survey (cholestyramine, niacin, gemfibrozil). Residents' apparent willingness to so readily accept and frequently prescribe a new agent like lovastatin may be an area of concern.

The frequent use of patient education materials and referrals to other health professionals by residents seems to be a positive finding, since this is likely to enhance the effectiveness of physician counseling. An alternative interpretation, however, is that this simply reflects the residents' poor confidence in their own counseling skills. An encouraging finding was that for both diet and drug therapy compliance, patient denial was rated the lowest of all of the potential obstacles to compliance by residents. This finding seems to show empathy toward patients who have difficulty making lifestyle changes.

In summary, this survey demonstrated that family practice residents have a high level of awareness and interest in elevated blood cholesterol as a risk factor for heart disease. As residents mature and gain outpatient experience in their second and third years, they demonstrate increased counseling confidence and include more younger and elderly adults in their routine screening of cholesterol risk. They report a generally appropriate use of dietary and pharmaceutical interventions, use of patient instructional materials, and referral to dietary counseling. They may be early adopters of new therapeutic agents and may prescribe medication early in cholesterol management. Compared with practicing physicians, they feel less well prepared to perform dietary counseling and less successful in helping patients change behavior, but do not appear to blame patients for having difficulty with lifestyle change. Residency educators should strive to foster better health promotion skills in residents in general, and dietary assessment and counseling skills in particular. The data support the conclusion that educators should also emphasize the importance of screening young adults and high-risk children.

Acknowledgments

The authors would like to thank the following "key contacts," without whom the survey, and its high response rate, would not have been possible: Columbia, Missouri: Elizabeth Garrett, MD; Eau Claire, Wisconsin: Jeffrey Sikkink, MD; Greensboro, North Carolina: Wayne Hale, MD; Iowa City, Iowa: Elizabeth Burns, MD; San Diego, California: Robert Garrett, MD; Shreveport, Louisiana: Michael Crouch, MD; Washington, Pennsylvania: Gary Silko, MD; Youngstown, Ohio: James Melloh, MD.

References

1. Report of the Working Group on Arteriosclerosis of the National Heart, Lung and Blood Institute. vol 2, DHEW Publication No. (NIH) 82-2035, Washington, DC, United States Government Printing Office, 1981.
2. The Lipid Research Coronary Primary Prevention Trial results: I. Reduction in incidence of coronary heart disease. *JAMA* 1984; 251:351-63.
3. 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; 251:365-74.
4. NIH Consensus Conference. Lowering blood cholesterol to prevent heart disease. *JAMA* 1985; 253:2080-6.
5. Corday E, Ryden R. Why some physicians have concerns about the Cholesterol Awareness Program. *J Am Coll Cardiol* 1989; 13:497-502.
6. Superko HR, Desmond DA, deSantos VV, et al. Blood cholesterol treatment attitudes of community physicians: a major problem. *Am Heart J* 1988; 116:849-55.
7. Schucker B, Bailey K, Heimbach JT, et al. Change in public perspective on cholesterol and heart disease: results from two national surveys. *JAMA* 1987; 258:3527-31.
8. Schucker B, Wittes JT, Cutler JA, et al. Change in physician perspective on cholesterol and heart disease: results from two national surveys. *JAMA* 1987; 258:3521-6.
9. Sobal J, Valente CM, Muncie HL, et al. Physicians' beliefs about the importance of 25 health promoting behaviors. *Am J Public Health* 1985; 75:1427-8.
10. 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.
11. Vivier PM, Dietrich AJ, Wittes LA. Management of elevated cholesterol levels by New Hampshire primary care physicians. *J Fam Pract* 1988; 27:167-72.
12. Schucker B, Wittes JT, Santanello NC, et al. Change in cholesterol awareness and action: results from national physician and public surveys. *Arch Intern Med* 1991; 151:666-73.
13. McBride PE, Pacala JT, Dean J, et al. Primary care residents and the management of hypercholesterolemia. *Am J Prev Med* 1990; 6(2):71-6.
14. Bell MM, Dippe SE. Recognition and treatment of hypercholesterolemia in a family practice center. *J Fam Pract* 1988; 26:507-10.
15. Madlon-Kay DJ. Family physician recognition and treatment of severe hypercholesterolemia. *J Fam Pract* 1987; 24:54-6.
16. Morris PD, Morris ER. Family practice resident compliance with preventive medicine recommendations. *Am J Prev Med* 1988; 4:161-5.
17. Nichols AW. Management of elevated serum cholesterol in a university-based family practice. *J Fam Pract* 1988; 26:281-5.
18. Shostek H, Fairweather WR. Physician response rate to mail and personal interview surveys. *Public Opinion Q* 1979; 43:206-17.
19. Wilkinson L. SYSTAT: the system for statistics. Evanston, Ill, SYSTAT Inc, 1986.
20. Mann KV, Putnam RW. Physicians' perceptions of their role in cardiovascular risk reduction. *Prev Med* 1989; 18:45-58.
21. American Academy of Pediatrics, Committee on Nutrition. Indications for cholesterol testing in children. *Pediatrics* 1988; 83: 141-2.
22. Bell MM, Joseph SJ. Screening 1140 fifth graders for hypercholesterolemia: family history inadequate to predict results. *J Am Bd Fam Pract* 1990; 3:259-63.
23. Garcia RE, Moodie DS. Routine cholesterol surveillance in childhood. *Pediatrics* 1989; 84:751-5.
24. Pacala JT. The relation of serum cholesterol to risk of coronary heart disease: implications for the elderly. *J Am Bd Fam Pract* 1990; 3:271-82.

For editorial comment, see page 237.