Cholesterol Measurement and Treatment in Community Practices

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A study was designed to examine the cholesterol measurement and treatment activities of primary care physicians in community practices. Three family practices of comparable size (one faculty practice and two community small-group practices) participated in the study. A random sample of 450 adult patients (150 from each site) was drawn from patient logs using a time series sampling method. Charts were reviewed for serum lipid evaluations, documentation of coronary heart disease risk factors, lipid-lowering activities, and other coronary heart disease risk-factor interventions.

Sixty-seven percent of the sample had cholesterol measures recorded. No differences were found in the rates of measurement for men and women. Multiple, detailed serum lipid evaluations were common, and recognition of high cholesterol as a problem even before 1980 was apparent. Almost one half (47%) of individuals with cholesterol >5.2 mmol/L (200 mg/dL) had a charted intervention, 64% if cholesterol >6.2 mmol/L (240 mg/dL). Diet was the most common intervention (73%), and medication was used in only eight cases. Nonpharmaceutical interventions appeared to be undercharted. An analysis of interpractice variations revealed strikingly consistent results, although some interesting differences were noted. These rates are at least double previously reported rates and suggest that primary care physicians play a major role in this national priority. **J Fam Pract 1990; 31:139-144.**

Decades of research into the causes, prevention, and treatment of coronary artery disease in the United States entered a new phase in 1987 when the National Institutes of Health launched the National Cholesterol Education Program (NCEP). A major thrust of this program is the mobilization of the nation's primary care physicians to more aggressively detect and treat elevated cholesterol levels (>5.2 mmol/L [200 mg/dL]) in individuals. The effectiveness of such a program will be determined by its ability to stimulate physicians to screen large numbers of individuals, to intervene when higher cholesterol levels are detected, and to lower the serum cholesterol and other risk factors for coronary artery disease in the populations they serve.

Despite this intensive program, little has been published about the behavior of physicians regarding risk-factor reduction in primary care offices. Only six studies[1–6] could be identified that described cholesterol activity in primary care offices in the United States, and all were focused solely on academic practices. None of these studies described screening activities in broad patient populations. Most described interventions for the highest cholesterol levels (eg, >6.7 mmol/L [260 mg/dL]) and reported relatively low rates (<50%) of intervention. There have been no reports on the ability of interventions in primary care settings to lower serum cholesterol.

This paper reports cholesterol measurement and treatment activities of primary care physicians in community practices using a retrospective chart review technique. The lipid evaluation processes used by community physicians and the intervention strategies they employ are documented, and the activities of these community physicians are compared with those previously reported in the literature.

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METHODS

Three family practice groups were chosen for this study. The faculty practice of the Department of Family Practice at Michigan State University (practice 1) had served as a base for the authors' investigations into the role of primary care in health promotion. Two community practices were chosen for their comparable size and varied characteristics that are described below. Together the three practices provided care to approximately 22,000 people, or 5% of metropolitan Lansing, Michigan.

Practice 1 was located in the Clinical Center, a multispecialty outpatient facility of the health colleges on the Michigan State University campus. The clinic was the primary practice site for 12 of the 18 board-certified faculty of the Department of Family Practice. There are no residents at this site. Twenty-three thousand visits per year were made by a mixed younger population, and there was a higher than average proportion of pregnancy and well-child services. The costs of the practice were comparable to the mean for family practices as reported by the American Medical Association. A successful contract with a network model health maintenance organization (HMO) encouraged preventive services. All cholesterol testing was done by a certified laboratory in the building or the affiliated hospital laboratory, both managed by the Michigan State University Department of Pathology.

Practice 2 was a four-physician practice in a suburban-rural area south of Lansing. Its volume of patients was comparable to the university practice, and growing rapidly as a result of its younger, aggressive, residency-trained family physicians. They participated in the same HMO plan as practice 1 and also were active in obstetric services. The patient population could be described as mainly middle class. Cholesterol testing was carried out at a local certified laboratory and in the office with quality control provided by the laboratory.

Practice 3 was also a four-physician practice. Located in a suburban-rural area west of Lansing, it was well established with one lead physician in the process of retiring. Two of the four physicians were residency trained. The volume of visits was also nearly 22,000 from mainly middle-class families. A large number of older patients and a smaller obstetric panel characterized this practice. Its cholesterol measurements were done by the same certified hospital laboratory used by practice 1 and by an office laboratory staffed by a certified laboratory technician, with quality control provided by the hospital.

Practice 1 had instituted a protocol in early 1987 to organize the practice to pursue more effectively cardiac risk-factor reduction. The protocol, based on the approach described by Heogg et al,[7] was similar to the NCEP guidelines. From interactions and past associations there was no indication that either practice 2 or 3 had special interests or abilities in preventive programming. They were asked to continue screening and treatment activities in their usual manner. Both practices indicated that their usual procedures approximated adherence to the general outline of the NCEP guidelines.

For this study a time series sampling method was chosen. Each practice agreed to provide the appointment logs for a specified week in May 1988, August 1988, and October 1988. For each of the three identified weeks and at each practice site, 50 individuals who were at least 18 years old and not older than 65 years were randomly selected from the appointment logs for a total sample of 450 different individuals. The age and sex distributions of the sample selected are displayed in Figures 1 and 2. There was no requirement that the chart contain notes from a history and physical examination or have recorded a health maintenance visit. All randomly chosen cases of patients who actually had a physician visit during the week sampled were included in the study. Individual identification numbers were assigned to preserve confidentiality. Lists linking patient names to identification numbers were held at the respective sites. The charts were reviewed and data recorded onto a standard form. One of the authors (C.W.K.) reviewed all records. She had no prior experience or training in ambulatory record review but is an experienced health educator.

All total cholesterol, high-density lipoprotein, low-density lipoprotein, and triglyceride levels found in the laboratory section of the charts, and interventions (diet, exercise, weight loss, smoking cessation, lipid-lowering drugs, and other) found in the progress notes were noted along

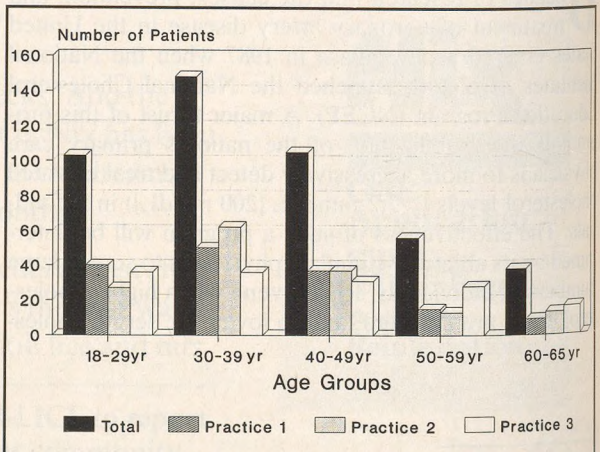

Figure 1. Age distribution of 450 patients in random sample from three family practices (150 patients from each). Practice 1, university faculty practice; practices 2 and 3, suburban-rural community practices.

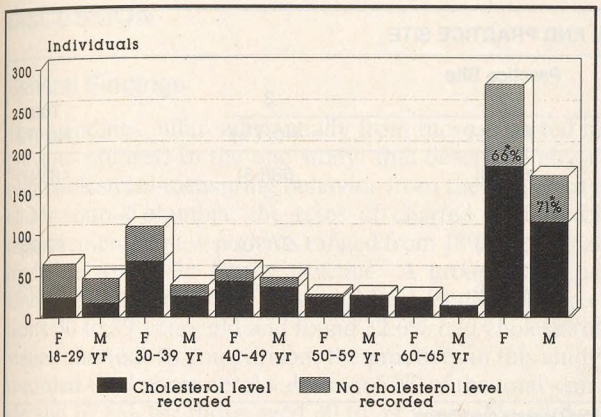

Figure 2. Cholesterol measurement behavior, by age and sex. The F (female) and M (male) bars to the right represent the total sample, in which women were slightly less likely than men to be measured. *Difference not significant.

with the recording dates. Stringent criteria were not employed for recording an intervention. The most cursory indication of an intervention in the progress notes was noted along with the date. Typical entries were "low-fat diet," "decrease/stop smoking," "exercise program," "1200-calorie diet," "low fats, send brochure." Age, sex, and date of entry into the practice (first visit) were recorded from all charts. Risk factors (personal history of ischemic vascular disease, family history of early heart disease or hyperlipidemia, hypertension, diabetes, obesity, and smoking) and significant chronic conditions were taken from databases (history) and problem lists if a cholesterol measurement was present.

All data were entered into a microcomputer database management program under the supervision of one of the authors (A.J.H.). The construction of groups for analysis was conducted using the database functions of a microcomputer spreadsheet program. All statistical analyses were simple differences of means or proportions[8] and were performed by hand by either of two authors (J.W.H. or A.J.H.).

RESULTS

The sample population reviewed had an average age of 38.8 years, lowered by the exclusion of those older than 65 years. Nearly one third of the sample was in the age cohort of 30 to 39 years. Practice 3 was slightly older, with an average age of 40.1 years. Practice 1 was youngest with an average age of 37.4 years (Figure 1). Women outnumbered men 63% to 37% in the sample (Figure 2). The sample from practice 2 was 72% female, whereas practice 3 subjects were 56% female. The subjects in practice 3 had been in the practice a mean of 10 years, while it had been only 4 years since the first visit for those in practices 1 and 2.

Measurement Behavior

Cholesterol measurements were obtained in 303 of 450 charts reviewed for a rate of 67%. The age-sex characteristics of the total sample compared with those with cholesterol measurements are displayed in Figure 2. Women were slightly less likely to be measured than men (66% vs 71%, P = NS). Those over 40 years were more likely to have measurements than those under 40 years (85% vs 53% [$z > 100$, $P < .001$]). Men over 50 years had cholesterol levels recorded in their charts 95% of the time; women under 30 years had measurements recorded only 38% of the time. The NCEP guidelines recommend measurement every 5 years, and the practices met this requirement in 288 of the 303 charts with cholesterol levels recorded. Table 1 shows variation in the rate of cholesterol measurement among practices. Practice 3 was low

TABLE 1. CHOLESTEROL-MEASURING BEHAVIORS, BY PRACTICE SITE

Behavior	Practice Site 1 (n = 150) No. (%)	Practice Site 2 (n = 150) No. (%)	Practice Site 3 (n = 150) No. (%)	Total (N = 450) No. (%)
Cholesterol measured	104(69)	110(73)	89(59)	303(67)
Cholesterol measured more than once*	54(52)	51(46)	61(69)	166(55)
HDL cholesterol charted*	33(32)	64(58)	36(40)	133(44)
LDL cholesterol charted†	17(71)	3(10)	6(16)	26(28)

*As percentage of those with a cholesterol measured.
†As percentage of those with cholesterol >6.2 mmol/L (240 mg/dL).
HDL, high-density lipoprotein.
LDL, low-density lipoprotein.

TABLE 2. FREQUENCY OF INTERVENTION, BY CHOLESTEROL LEVEL AND PRACTICE SITE

Cholesterol Level	Practice Site 1 No. (%)	Practice Site 2 No. (%)	Practice Site 3 No. (%)	Total No. (%)
Any cholesterol >5.2 mmol/L (% with intervention*)	56(38)	61(49)	66(53)	183(47)
Any cholesterol >6.2 mmol/L	24(54)	31(65)	37(70)	92(64)
First cholesterol done before 1988† and first cholesterol >5.2 mmol/L (% with repeat measurement)	33(79)	43(60)	49(78)	125(72)

*Any recorded intervention: low-fat diet, weight reduction, exercise, smoking cessation, lipid-lowering medication.
†Requiring first cholesterol be done before 1988 assures an opportunity for the practice to respond before the sampling date.
5.2 mmol/L = 200 mg/dL.
6.2 mmol/L = 240 mg/dL.

with 59%, and practice 2 was high at 73% ($z = 5.38$, $P < .001$).

Cholesterol was measured repeatedly in many individuals. Thirty-seven percent of all charts (166 cases) had two or more cholesterol levels recorded. If the first cholesterol measurement was >5.2 mmol/L (200 mg/dL), a repeat measurement was noted 65% of the time (161 cases). When the first level was >6.2 mmol/L (240 mg/dL) (63 cases), at least one repeat measurement was noted in 73% of charts. When adequate time to respond to a high cholesterol was given by examining first cholesterol readings done before 1988, rates of recheck increased to 72% (125 cases >5.2 mmol/L [200 mg/dL]) and 82% (49 cases >6.2 mmol/L [240 mg/dL]). Fifty-five percent of those measured were remeasured at least once. Fifty-six individuals had four or more measurements.

High-density lipoprotein levels were determined in 44% of those with a total cholesterol determination and 56% of the time when any cholesterol >6.2 mmol/L (240 mg/dL) was recorded. Practice 2 obtained a high-density lipoprotein reading on 58% of those with cholesterol measured, while practice 1 was low with 32%. Low-density lipoprotein (calculated) was present in only 26 records (8.6%). Practice 1 accounted for 17 of these cases or 71% of those with any cholesterol measuring >6.2 mmol/L (240 mg/dL).

Interventions

At least one of six standard interventions (diet, weight loss, exercise, medication, smoking cessation, and other) was charted in 47% of the records with any cholesterol level recorded at >5.2 mmol/L (200 mg/dL) and for 64% (Table 2) of individuals with any cholesterol recorded at >6.2 mmol/L (240 mg/dL). For people with total cholesterol >5.2 mmol/L (200 mg/dL), diet was the intervention of choice (73%), followed by weight reduction (37%) and exercise (27%). Medications were used only eight times (9%). Twelve (44%) of 27 smokers were recorded as counseled toward cessation. For the seven cases in which a drug was prescribed for high cholesterol (one for hypertriglyceridemia), the average cholesterol reading for those on medication was 7.18 mmol/L (278 mg/dL), compared with 6.33 mmol/L (245 mg/dL) for those with other interventions.

Practice variations were detected (Table 2). Practice 3 had the highest rate of intervention (at 70%) for those with any cholesterol level >6.2 mmol/L (240 mg/dL). Practice 1 recorded interventions 54% of the time with measurements of the same level ($z = 2.93$, $P < .005$). The methods of intervention were consistent among practices except for the use of medications. Six of the eight individuals on lipid-lowering drugs came from practice 3.

The likelihood of an intervention was not influenced by sex (46% of women, 47.5% of men when any cholesterol measurement was >5.2 mmol/L [200 mg/dL]) ($z = .41$, $P = .35$). In this same group with higher cholesterol, age did play a role. For those aged 40 years and over, 52% had at least one intervention recorded, compared with 36% of those under 40 years ($z = 3.83$, $P < .001$). The rates of intervention were positively influenced by the presence of a recorded risk factor. In those with any cholesterol reading >5.2 mmol/L (200 mg/dL), 63% had an intervention if a risk factor was present, compared with 34% with no risk factor ($z = 7.76$, $P < .001$).

DISCUSSION

General Findings

These findings differ substantially from those reported in previous studies. In the one study[1] that described physician cholesterol-measuring behavior from the University of Missouri–Columbia, the rates of charted cholesterol measurement in new patients ranged from 18% in internal medicine to 8% in family practice. A group from the University of California, Los Angeles,[5] studied only patients 30 to 39 years old and found 32.6% had cholesterol values charted. In comparison, the practices in this study recorded total cholesterol values on 67% of the total sample and 62.6% for those aged 30 to 39 years. No studies were found that reported rates of high-density lipoprotein, low-density lipoprotein, or repeat measurement behaviors. This sample demonstrated relatively high rates of ongoing interest and more detailed evaluation. Most of the reports in the literature examined treatment for cholesterol of relatively high levels only.[2–6] Rates were variable, but all are below those reported here. One study[2] noted a marked male-female disparity (43.5% vs 21.5%) in the rate of intervention when a cholesterol measurement was >6.7 mmol/L (260 mg/dL). No disparities in intervention rates for men and women were detected here. No study recorded treatment rates greater than 50% for any group except those at very high levels (>7.75 mmol/L [300 mg/dL]). Practices in this study intervened in 64% of those with any level >6.2 mmol/L (>240 mg/dL).

Diet has been the mainstay of treatment in all reports to date. The types of interventions used in these practices and low rates of drug use seem consistent with previous reports. No evidence of referral out of the practice for dietary counseling or drug prescription was found. Practice 2 had a contracted dietician see a small number of patients in the office. Diet counseling in practice 1 was designed to use dieticians in a small percentage of cases, and that pattern appears consistent with the two community practices.

In a reasonably well-educated population, many individuals may have already considered specific dietary, exercise, or weight-loss programs that they would institute should the screening cholesterol levels be elevated. The recording in the chart of this decision may be erratic. Repeat cholesterol measurement may therefore be a more sensitive indicator of intent of the clinician than the charting of specific interventions. In this sample, 82% of those with a first cholesterol value >6.2 mmol/L (240 mg/dL) before 1988 had a repeat. Follow-up visits for those with a first cholesterol during 1988 would be missed by this data-collection schedule.

The most surprising findings in this study came when the rates of measurement and intervention were compared among practices. Practice 1 was expected to have been more active than the community practices as a result of the organizing efforts that had taken place. Intervention rates in practice 3 were much higher (70% vs 54%) than practice 1 when any cholesterol reading was greater than 6.2 mmol/L (240 mg/dL). This difference may be a function of better charting, which in itself would be impressive. Practice 2, whose patient sample was younger and included more women, had the highest rates of screening, 72% of all charts. Although these practices are well regarded and actively involved in the training of students and residents, they seem fairly typical in other ways of numerous higher quality family practices throughout Michigan.

Data Limitations

To attempt to describe the behavior of physicians in office settings, the method of measurement must not alter that behavior substantially. Retrospective chart review has a minimal impact on the behavior of clinical personnel. The cost of such an approach may be measured in several ways. Approximately 200 hours were needed for data collection for this study. Chart review can occur at any time the chart is not in use, accommodating the researcher's schedule. Data collected from chart review have inherent weaknesses, however. Charts are always incomplete reflections of the process of care. Omissions of actions, intentions, and understandings will always plague this data source.

In this study several problems were encountered with the data. Cholesterol measurements were often secondary to multiphasic screening for other problems. In practice 2 even the method of cholesterol determination was unclear because results were transferred to a flow sheet and the original laboratory slip discarded. It was often not clear whether values recorded were fasting or nonfasting cholesterol determinations. Interventions such as diet were often likely in place, but not charted, and therefore not recorded here. Interventions could not be linked to a particular cholesterol test result, since they might be expected to occur in response to a pattern of results. Certainly all patients with identified diabetes are advised as to diet in some way, but only 68% of those with diabetes in this sample had clear dietary advice recorded. Regional norms would suggest that 30% of this population would be smokers, but only 6% of this sample was charted as smokers. Risk factors in particular may escape detection by this methodology.

Although statistically significant results could be demonstrated, more important questions relate to how representative these practices are of primary care available in the United States. The ability to profile the entire primary care system would be a formidable task not likely to be

attempted. The number of practices needed to describe accurately the several medical specialties and many diverse communities is unclear. The limited ability to generalize from data such as those presented here represents a serious limitation.

CONCLUSIONS

The ability of this study to detect high rates of cholesterol measurement and intervention behaviors using low-cost chart review techniques is encouraging. Chart review probably overrepresents the intent to measure cholesterol because of its presence on panel tests, and underestimates interventions because of charting lapses. This study, however, demonstrates more awareness by primary care physicians than previously reported. Further studies encompassing more practices and communities are feasible and desirable.

Primary care practices form a potent weapon in the battle to improve primary and secondary prevention efforts for the US population. This study demonstrates that family physicians are very active in this effort. Additional studies of effective strategies in community settings are crucial in order to realize the promise primary care offers. Such studies should benefit primary care physicians who need research more appropriate to their settings, and should certainly benefit the large populations they serve.

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