

National Trends in the Management of Cardiovascular Disease Risk Factors in Children: Second NHLBI Survey of Primary Care Physicians

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ABSTRACT. *Background.* The evidence that atherosclerosis begins during adolescence has led to the belief that primary prevention of cardiovascular disease (CHD) should commence in childhood. Although several national guidelines have been issued for the detection and treatment of CHD risk factors in children, concerns continue to be expressed regarding what constitutes appropriate measures and when to institute such measures in children. A 1988 national survey of primary care physicians revealed variation in the management of CHD risk factors in children by physician categories, which suggested the underlying quandary among physicians regarding CHD risk factors in children.

Objective. To assess current clinical management of pediatric CHD risk factors in the primary care setting and also to evaluate time trends between the current and 1988 surveys.

Methods. A 25-minute telephone survey was conducted with 1036 of eligible physicians (ie, >20 hours per week direct patient care including at least five pediatric patient contacts) selected from a national probability sample in three practice categories (family practitioners, pediatricians, and general practitioners). The questionnaire assessed the current practice of these physicians in the primary care setting regarding cholesterol and blood pressure (BP) screening and treatment, both nonpharmacologic and pharmacologic, and physician attitude and knowledge.

Results. Cholesterol screening in children was performed by 75.7% of all physicians. Nonscreening was highest among general practitioners (38%) and lowest among pediatricians (12%). BP was measured by almost all physicians. The majority of physicians (71%) prescribed diet as the first cholesterol-lowering step, but ~16% also used pharmacologic therapy. Cholesterol synthesis inhibitors and bile acid sequestrants were the drugs used most commonly. Approximately 25% of physicians have used drugs in children to treat high BP. Diuretics and β -blockers were used most frequently. More than one fourth of the physicians had some concern about identifying and treating children for CHD risk factors. There was slightly less cholesterol measurement

in 1995 compared with 1988, and no notable increase in the knowledge regarding major CHD risk factors.

Conclusion. The results of the second National Heart, Lung, and Blood Institute survey of primary care physicians suggest that additional inroads need to be made in the dissemination of the national guidelines for the management of CHD risk factors in children, including appropriate use of pharmacologic agents. *Pediatrics* 1998; 102(5). URL: <http://www.pediatrics.org/cgi/content/full/102/5/e50>; children, physician practice, cholesterol, blood pressure, screening, treatment.

ABBREVIATIONS. CHD, cardiovascular disease; BP, blood pressure; NHANES, the National Health and Nutrition Examination Surveys; LDL, low-density lipoprotein; DISC, Dietary Intervention Study in Children; NHLBI, National Heart, Lung, and Blood Institute; PD, pediatrician; FP, family practitioner; GP, general practitioner; AMA, American Medical Association; AOA, American Osteopathic Association; NCEP, National Cholesterol Education Program; ACE, angiotensin converting enzyme.

Several national and government organizations have advocated primary prevention of cardiovascular disease (CHD) in childhood by issuing guidelines to help children maintain desirable blood cholesterol and blood pressure (BP) levels.¹⁻⁶ Because available information on the benefits of CHD risk factor modification is derived primarily from research conducted in adults,⁷⁻¹² a question remains regarding the appropriateness of preventive strategies for children using adult-based scientific evidence.^{13,14} On the other hand, the presence of atherosclerotic plaques in late adolescence has provided the public health rationale for initiation of CHD prevention measures in childhood as true primary prevention.^{15,16} There also is widely held belief that many lifestyle habits that impact CHD risk factors later in life have their environmental and behavioral roots early in childhood and possibly even in utero.^{17,18} Although not proven, it is generally believed that many behavioral traits that are associated with adverse CHD risk factors are best managed early in childhood before personal habits become established permanently.

There has been a dramatic decline in CHD mortality during the past 3 decades.¹⁹ Also, the average serum cholesterol levels of US adults declined from 213 to 205 mg/dL between the two national surveys less than a decade apart, the National Health and Nutrition Examination Surveys (NHANES) I and II.^{20,21} During the same period, the dietary fat content

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of US children also decreased from 36.3% to 34.0% of daily calories.^{22,23} Yet, concerns continue to be expressed in the medical community that fat reduction in the diet of actively growing children may not be desirable^{24–26} because of the potential impact of a fat-restricted diet on protein, iron, and calcium nutrition, which might harm growth.^{25–27}

To address some of these concerns, a large, multicenter, long-term, randomized, controlled clinical trial of the fat-modified diet in children with elevated low-density lipoprotein (LDL) cholesterol levels, Dietary Intervention Study in Children (DISC) was sponsored by the National Heart, Lung, and Blood Institute (NHLBI). The DISC trial demonstrated that dietary fat reduction was safe in children undergoing prepubertal growth.^{28,29} The intervention diet, which was reduced in total fat to 28% of daily calories, achieved a statistically significant lowering of LDL-cholesterol in peripubescent children while maintaining normal growth and nutritional status.^{29,30} The DISC report was followed by several letters to the editor of the *Journal of the American Medical Association* (which published the trial results) that expressed concern and skepticism regarding cholesterol-lowering in children.^{31–33}

An NHLBI-sponsored national survey of primary care physicians, conducted in 1988, revealed that variation existed in the detection and management of CHD risk factors in children.^{34,35} The age of screening and treatment varied among three categories of primary care physicians: pediatricians (PD), family practitioners (FP), and general practitioners (GP). The use of drug therapy for elevated blood cholesterol levels also varied by more than twofold according to practice categories. Of greater concern, only half of the physicians surveyed felt prepared to provide dietary counseling to reduce cholesterol, and only 14% felt they were successful with it. Less than one fourth of the physicians surveyed cited all three major CHD risk factors (high cholesterol, high BP, and cigarette-smoking) in an open-ended question. Other surveys of PD and FP physicians also reported similar results.^{36–38} Because the 1988 NHLBI survey was conducted before a wide dissemination of the cholesterol guidelines for children recommended by the NHLBI Expert Panel on Blood Cholesterol Levels in Children and Adolescents, the variation seen in the clinical practice might have been attributable to the prevailing lack of what would be viewed as “standard” therapy for elevated blood cholesterol. However, with the availability of the national guidelines at present, there ought to exist less heterogeneity in the clinical practice of cholesterol management and greater conformance to the recommended guidelines.³

The purpose of this report is to present the results of a second national survey of primary care physicians conducted in 1995 that examined the most recent approaches to the detection and treatment of CHD risk factors in children in the primary care setting. This report also presents time trends in the findings between the 1988 and 1995 surveys.

METHODS

Telephone surveys were conducted with 1441 practicing primary care physicians in the winter of 1987–1988, and again with an independent sample of 1036 physicians in the winter and spring of 1995, to assess trends in physicians’ knowledge, beliefs, and practices regarding prevention, management, and treatment of CHD risk factors in children. The details of the 1988 survey methods have been presented in a previous report.³⁴ For the 1995 survey, a national probability sample of 3530 physicians in three specialties was selected from the combined files of the American Medical Association (AMA) and the American Osteopathic Association (AOA). These specialties were FP, GP, and PD physicians practicing in the United States. The combined sample was stratified by specialty (FP, GP, PD), years of experience (<15, 15 to 29, >30) and geographic region (nine census divisions). Within each of the resulting 81 strata, records were ordered by state and within state by ZIP code. Systematic random sampling was used to select physicians within each specialty.

Those physicians who were selected as potentially eligible for the survey received a letter from the Director of the NHLBI explaining the purpose of the survey and offering a \$30 honorarium for their participation. The letter was followed by telephone calls to schedule interviews. Final eligibility included physicians practicing in one of the three specialties listed above who treated at least five children (younger than age 18) per week and who also spent at least 20 hours per week in direct patient care. Multiple attempts (ranging in average from 6.3 calls per GP to 10.0 per FP and 8.6 per PD) were made before categorizing a physician as a nonrespondent.

Two versions of the questionnaire for the 1995 survey were developed to be able to address questions on recent developments in the field of pediatric preventive cardiology but still to limit the duration of the interview to ~25 minutes. Each version contained a mutually exclusive set of questions that addressed new developments in prevention and treatment of CHD in children, but the majority of the questions appeared in both versions. Because one of the aims of the present survey was to compare the 1988 and 1995 findings, selected core questions appeared in both surveys. However, there was variation in the way some questions were asked. For instance, the information on treatment for high cholesterol and high BP from the 1988 survey was collected only for the subset of respondents who had actually treated children with these conditions. In the 1995 survey, the questions about treatment were asked of all physicians in the sample. Only one version of the questionnaire was administered to each physician; the version selected for each physician was assigned randomly. As a result, the sample size for some of the questions was half of the total population surveyed.

Results were analyzed by physician specialty, years of practice, geographic region, and age of children within practice. χ^2 statistics were computed to identify significant differences across surveys. Both unweighted and weighted estimates were computed for the 1995 survey, but generally we report the unweighted percentages because both sets of estimates were similar, and this allows our reporting to be consistent with that for the 1988 survey. The weighting factors used for the 1995 survey was the inverse of the sampling rates for each of the three specialties, the inverse of the locatable rate, and the inverse of the cooperation rate. These factors were then applied to subgroups defined by specialty, years of experience, and geographic regions.

For comparison of treatment trends between the two surveys, no adjustments to the denominators were made to make a most conservative comparison for those situations in which the rates for the 1995 survey were proportionately higher than those obtained in 1988.

RESULTS

Survey Sampling and Response

Survey Sample and Response Rate

A total of 1036 (430 PD, 398 FP, 208 GP) physicians completed the 1995 interview and were included in the analysis. The overall response rate was 52.5%. This rate was computed as the number of completed interviews divided by the number of locatable cases minus ineligible respondents. There was little differ-

ence in the response rates between the two sampling frames of AMA and AOA physicians (52.4% vs 53.0%). The response rates varied significantly by specialty ($P < .001$), with the best response by the PD group (63.6%), followed by the FP (50.7%) and GP (40.3%) groups (Table 1). Response rates by years of experience across all specialties showed a trend toward declining participation with length of career ($P = .05$), with 55.4% for those with <15 years of experience decreasing to 48.4% for those with >30 years. Within specialty, however, there was a reverse trend by years of experience for the PD group, and for the FP group, there was a large drop in participation in the group with 15 to 29 years of experience. The ineligibility rate in the GP group was 54.4% compared with 23.3% and 22.9% in the PD and FP groups, respectively. Because of such a high rate of ineligibility among the aging specialty group of GP, the reduced follow-up effort in this subgroup early in the latter half of the survey accounts in part for the lower rate of response in the GP group. The average number of calls per GP was 6.3 compared with ~9 calls per physician in the other two specialties.

Comparison of the Response Rates Between the Two Surveys

Compared with the 1988 survey response rate of 66.8%, the 1995 survey had a lower response rate of 52.5% (Table 1). Because the same survey firm conducted both surveys and similar physician honoraria were involved, the lower response rate of the 1995 survey has been postulated to be attributable to the increased difficulty encountered in involving physicians in lengthy telephone interview surveys. Although the unlocatable rates of the surveys were virtually identical at ~8.4%, ineligibility grew from 25.4% in the earlier survey to 35.8% in 1995. For example, the percent of retired GP physicians increased from 10.5% in 1988 to 17.9% in 1995 and the percent of ineligible GP physicians (because they did not see at least five children per week) increased from 20.5% in 1988 to 27.9% in 1995. PD and GP physicians had the highest increases in ineligibility: 10.2% to 23.3% and 39.1% to 54.4%, respectively. The nonresponse in 1995 was 26.6% compared with 21.9% in 1988. In addition to a direct refusal to participate, there also were several forms of passive refusals such as not being able to come to the phone at the scheduled time or the receptionist being unable to get a definite response from the physician to schedule a call. Compared with the 1988 response rate, which was relatively similar among the three practice categories, there was a notable difference by

specialty in the response rates of the 1995 survey. The change was greatest for the GP group (60.6% in 1988 vs 40.3% in 1995), as discussed, whereas the least change was seen in the PD group (69.9% vs 63.6%).

Because the response rate in the 1995 survey was lower than expected, the data were examined for potential response bias. Although there was response variation by specialty, the percentages of responders and nonresponders were similar by census region and years of experience. In addition, there appeared to be no significant differences between the responders and their respective sampling frame; the years of experience by census region distributions were the same between the responders and the sampling frame by specialty.

Risk Factor Screening

Blood Cholesterol Levels

In 1995, most of the cholesterol screening was performed in high-risk children, with a positive family history of heart disease with variation by specialty in the screening effort and with PD leading the screening (Table 2). The lowest rate of cholesterol screening of high-risk children (including those physicians who screened routinely) was seen in the GP group (62.5%). Approximately one third of the GP and FP physicians did not obtain cholesterol measurements in children. The overall proportion of physicians doing cholesterol screening was 75.7%, either routinely or only for high-risk children.

The earliest age for screening also varied by practice categories, with physicians in the PD group initiating screening of high-risk children much earlier in life than do those in the other categories ($P < .001$) (Table 3). FP and GP physicians tended to begin screening in older children, with the largest segment initiating screening in adolescents. The average earliest age for cholesterol screening, when there was a positive family history, ranged from 4.7 years among PD to 8.7 years for GP physicians. The age distribution of the children seen by the three specialty groups differed, with the PD group tending to treat younger children. However, a majority of each specialty treated children in each of the age subgroups (younger than age 3, 3 to 12, and 12 to 17 years of age).

BP

Almost all (99%) physicians with pediatric patients performed routine BP measurements, with no signif-

TABLE 1. Survey Participation by Practice Specialty and by the Survey Year

Response Status	1995 Survey				1988 Survey			
	FP	GP	PD	Total	FP	GP	PD	Total
Sampling frame (N)	1097	1427	1006	3530	955	1451	853	3259
Ineligible (%)	22.9	54.4	23.3	35.8	18.0	39.1	10.2	25.4
Not locatable (%)	5.6	9.5	9.5	8.3	7.4	8.1	10.3	8.5
Nonresponse*	35.6	20.9	25.0	26.6	23.9	19.6	23.7	21.9
Completed interviews	36.3	14.6	42.7	29.3	52.7	32.0	55.6	44.2
Response rate	50.7	40.3	63.6	52.5	70.6	60.6	69.9	66.8

* Direct refusals and others.

TABLE 2. Percentage of Physicians Who Measure Cholesterol Levels by Specialty

Specialty	N	Routinely (%)	Positive Family History Only (%)	Not Screen (%)
FP	398	12.6	56.5	30.9
GP	208	16.3	46.2	37.5
PD	430	21.6	66.5	11.9*
All	1036	17.1	58.6	24.3

* Statistical significance level of difference in the proportion of nonscreening PD physicians from both FP and GP physicians at $P < .001$.

TABLE 3. Earliest Age of Cholesterol Screening Because of Positive Family History, by Specialty

Age (y)	Specialty			
	FP% (n = 127)	GP% (n = 64)	PD% (n = 191)	All% (n = 382)
Birth-4	12.6	12.5	52.4	32.5
5-9	38.6	31.3	34.0	35.1
10-17	45.7	53.1	12.0	30.1
Don't know	3.2	3.1	1.6	2.4
Average age	8.5	8.7	4.7*	6.6

* Difference in average ages of cholesterol screening between the PD and the FP and GP groups combined was significant at $P < .001$.

inant variation across the physician categories. However, the earliest age of BP measurements differed among practitioners, with nearly all PD physicians initiating screening in children younger than age 5 years. The GP group tended to initiate screening children who were older, with the mean age of earliest routine BP measurement at 6.9 years, compared with an average age of 5.4 for the FP group and 2.9 for the PD group.

Treatment

Blood Cholesterol

A majority (70.8%) of physicians who screened children for cholesterol recommended diet as the first therapy for managing elevated blood cholesterol levels. An additional 17.4% recommended diet and exercise combined (Table 4). Low-fat diet was the form of dietary therapy mentioned most frequently. Only one third of those treating with diet recommended a low-saturated-fat diet. There were no significant differences in the selection of the first treatment approach by practice category (although a smaller proportion in the GP group tended to pre-

TABLE 4. First Therapies Used to Treat High Blood Cholesterol Levels (N = 1024)

Therapy	Specialty			
	FP%	GP%	PD%	All%
Dietary management	71.8	73.4	68.7	70.8
Dietary management and exercise	20.1	12.8	17.1	17.4
Exercise	0.8	3.0	1.6	1.6
Drug therapy	0.5	0	0	0.2
Refer to specialist*	4.3	5.9	10.1*	7.0
Other	1.3	1.0	1.2	1.2
Don't know	1.3	3.9	1.4	1.9

* Significance level of difference between the PD and the FP and GP groups combined at $P = .0014$.

scribe diet and exercise combined). There was a trend for more physicians in the PD group to refer children with high cholesterol to specialists. Among the three practice categories, physicians in the PD group recommended dietary therapy for younger-age children, with the child's average earliest age being 4.7, compared with ~8 years of age for physicians in the FP and GP groups.

Approximately 16% of physicians used drug therapy to treat high blood cholesterol levels in children. More physicians in the GP group (22.1%) tended to prescribe medications than those in the PD (12.1%) or FP (16.6%) groups (Table 5). The largest proportion of the physicians using drugs to treat high cholesterol in children prescribed cholesterol synthesis inhibitors (48.2%), followed by bile acid sequestrants (37.8%). Approximately 10% prescribed nicotinic acid and 10% prescribed fibrates. There was a significant difference in the selection of drugs by practice categories. Bile acid sequestrants, the drug type of choice recommended by the National Cholesterol Education Program's (NCEP) Expert Panel on Blood Cholesterol Levels in Children and Adolescents, were the drugs prescribed by the largest proportion of physicians in the PD group using drug therapy and also by physicians with <15 years of experience. On the other hand, cholesterol synthesis inhibitors were prescribed by proportionately more physicians in the FP and GP groups and by those with >15 years of experience. Approximately 20% of physicians in the GP group who used drugs to treat high blood cholesterol levels in children stated that they used fibrates.

BP

Dietary management was the most frequently mentioned first therapy by all physician categories (~60%). Low-sodium diet (45.3%) and weight reduction (24.3%) were the two most frequently prescribed nonpharmacologic first therapies. Of those physicians who treated elevated BP in children with drugs (25.5%), the largest proportion used diuretics initially (Table 6). The second choice (by a small differ-

TABLE 5. Drugs Prescribed for High Cholesterol by Specialty

Drug	Specialty			
	FP% (16.6%)*	GP% (22.1%)*	PD% (12.1%)*	All% (15.8%)*
Cholesterol synthesis inhibitors**	59.1	58.7	25.0	48.2
Bile acid sequestrants	34.9	32.6	46.2	37.8
Nicotinic acid	7.6	8.7	15.4	10.4
Fibrates	7.6	19.6	5.8	10.4
Probuocol	4.6	17.4	1.9	7.3

* Percentage of the total sample prescribing any medication for high cholesterol: total sample, all (n = 1036); FP (n = 398); GP (n = 208); PD (n = 430).

** Statistical significance level of difference between PD physicians and FP and GP physicians combined at $P < .001$ (Note: Test for significance was performed only for the two drugs prescribed most commonly.)

Note: All percentages for drug types in Table 5 are based on only those physicians who ever prescribed cholesterol-lowering drugs for children.

TABLE 6. Percentage of Physicians Who Prescribe Drugs to Treat High BP

Drug	Specialty			
	FP (24.1%)*	GP (30.0%)*	PD (24.8%)*	All (25.5%)*
Diuretics	43.8	53.3	63.6	54.1
β -blockers	41.7	56.7	60.0	52.6
Vasodilators	14.6	10.0	20.0	15.8
ACE inhibitors	41.7	50.0	36.4	41.4
Calcium antagonists	37.5	43.3	27.3	34.6
Other drugs	14.6	26.7	12.7	16.5
No response**	12.5	6.7	5.5	8.3

* Percentage of the version A questionnaire sample by specialty (all = 521, FP = 199, GP = 100, PD = 222).

All percentages for drug types in Table 6 are based on only those physicians who ever prescribed cholesterol-lowering drugs for children. Percentages in each column add up to more than 100% because more than one drug could have been prescribed to treat high BP in children.

Note: Differences between PD physicians and FP and GP physicians grouped together do not reach statistical significance.

ence) was use of β -blockers. Angiotensin converting enzyme (ACE) inhibitors were the third most frequently mentioned drug for treating elevated BP in children. Of those who prescribed drugs, approximately one third used combined drug therapy. Physicians in the PD group, more so than those in the other groups, tended to prescribe diuretics as the first antihypertensive drug of choice.

Other Risk Factors

Information on smoking habits was asked of patients by almost every (95.6%) physician. However, only one third (32.2%) asked about smoking at each encounter with the patient and 62.5% at most or every encounter. Approximately 61% of physicians inquired about physical activity in their pediatric patients. For the treatment of obesity in children, dietary restriction and increased exercise were the two treatments prescribed by most physicians. Drugs were very rarely prescribed for treating obesity (appetite suppressants by 0.2% and other drugs by 0.7% of physicians).

Attitudes and Knowledge

Approximately 27% of physicians responded that there might be some negative psychological effects

associated with identifying children as having a CHD risk factor (Table 7). One third of the primary care physicians expressed some concerns regarding the impact of a cholesterol-lowering diet on growth and development in children. More physicians in the GP group than in other specialties (30.8% compared with 18.8% and 16.8% for PD and FP physicians, respectively) tended to express some concern regarding dietary modification as a burden on the child's family. The majority of physicians felt prepared to provide dietary counseling, and approximately half of the physicians felt that they were successful in helping their pediatric patients achieve dietary changes to lower blood cholesterol levels.

When asked in an open-ended question to list major CHD risk factors for people of all ages, 61% of physicians cited elevated blood cholesterol levels, 55% cited hypertension, and 69% cited cigarette-smoking. Fewer PD than FP or GP physicians listed these three risk factors. The most frequently cited major risk factor was family history of CHD (73.3%). Table 8 lists the proportion of physicians by specialty who cited other risk factors for the 1995 survey.

Time Trends

Results of the 1988 survey were compared with those of the current (1995) survey to assess secular changes in the screening and management of CHD risk factors in children, because the NCEP guidelines for children were first released in 1987. Compared with 1988, there was more routine screening of children for high cholesterol (17% in 1995 vs 9% in 1988) but somewhat less screening of children with a positive family history of CHD (75.3% in 1995 vs 82.7% in 1988). (These latter figures included those who screened routinely plus those who screened only when there was a positive family history.) Although there was a decrease in screening among all three practice categories, the greatest reduction in screening was seen in the GP group, with an absolute change of 16.5%, and the least in the PD group, with a 6.4% change. There was no notable change in the earliest age of obtaining cholesterol measurements.

Low-fat diet was prescribed by a larger proportion of physicians for elevated cholesterol in 1995 than 7 years previously (63% of physicians in the 1995 survey compared with 44% of physicians in the 1988

TABLE 7. Percentage of Physicians Who Agree Strongly or Moderately With Statements About CHD Risk Factors in Children by Practice Category

Statements	Specialty			
	FP% (n = 398)	GP% (n = 208)	PD% (n = 430)	All% (n = 1036)
Cholesterol-lowering diet could lead to impairment of child's growth and development ^a	25.6	29.8	37.9	31.6
Identifying children as having a CHD risk factor could have a negative psychological effect ^b	21.1	36.5	27.0	26.6
Involving the family of a high-risk child in diet modification could create a burden ^c	16.8	30.8	18.8	20.5
I feel prepared to provide dietary counseling to children to lower serum cholesterol	75.6	70.2	75.8	74.6
I am successful in helping children achieve diet changes to lower serum cholesterol	45.7	51.0	50.2	48.6

^a Statistical significance level of difference between PD physicians and FP and GP physicians combined at $P < .001$.

^b Statistical significance level of difference between FP and GP physicians at $P < .001$.

^c Statistical significance level of difference between FP and GP physicians and between GP and PD physicians at $P < .001$. No statistically significant difference between FP and PD physicians.

TABLE 8. Changes in Factors Cited as Major CHD Risk Factors: 1988–1995

	1988 Survey	1995 Survey	Change in Percentage
Elevated cholesterol			
FP	62.8	72.2	+9.4
GP	50.1	59.4	+9.3
PD	41.4	51.9	+10.5
Hypertension			
FP	57.5	65.5	+8.0
GP	45.3	57.1	+11.8
PD	36.3	45.8	+9.5
Cigarette-smoking			
FP	62.0	81.6	+19.6
GP	48.1	67.3	+19.2
PD	36.4	57.6	+21.2
Diabetes			
FP	39.2	52.7	+13.5
GP	23.8	41.9	+18.1
PD	12.3	18.0	+5.7
Family history of CHD			
FP	61.8	78.5	+16.7
GP	50.3	64.2	+13.9
PD	67.4	72.2	+4.8

survey). There also was a sizable absolute increase (30%) in the recommendation of exercise in 1995 to treat high cholesterol. However, the proportions recommending weight reduction to treat elevated blood cholesterol were similar in the two surveys. Among physicians who prescribed drug therapy (15.8% of those in the 1995 survey compared with 12% of all physicians in the 1988 survey), the type most used for high cholesterol in children in 1995 were cholesterol synthesis inhibitors (48.2%) compared with 14% using statins in 1988. There was a concomitant decrease in the proportion using bile acid sequestrants, 37.8% from 58%.

BP in children generally was measured by all physicians, both in 1988 and in 1995. However, there was a significant change in the therapies recommended to treat elevated BP. There was an overall decrease in the use of low-sodium diet, weight reduction, and pharmacologic therapy.

Although there was an overall gain in the frequency with which physicians cited the three major CHD risk factors, the incremental gain was relatively small for elevated blood cholesterol and BP. For instance, there was an absolute gain of ~10% for high BP and approximately the same for elevated blood cholesterol. There were no notable differences among the three practices.

DISCUSSION

The results of the 1995 NHLBI national survey of primary care physicians indicates that as in 1988, variation still existed among different physician specialties in the clinical management of CHD risk factors in children. In 1995, PD physicians still tended to screen and initiate treatment in younger children.³⁴ Whereas half of the physicians in the PD group performed their earliest cholesterol screening in children younger than age 5 years, a similar proportion of FP and GP physicians did their earliest screening in children older than age 10. Also, more PD physi-

cians did cholesterol screening than did FP and GP physicians.

In general, most physicians selected dietary therapy as the first treatment step to manage high blood cholesterol levels. However, cholesterol-lowering drugs in children were used by ~16% of the physicians surveyed, with GP physicians as the most frequent (22%) prescribers and PD physicians as the least frequent (12%). The drugs used most frequently were statins, followed by bile acid sequestrants. Although fibrates were prescribed by physicians in all three categories, physicians in the GP group were the most frequent users, with 20% of GP physicians who used drug therapy in children prescribing fibrates. Approximately one fourth of the physicians surveyed responded that they had used drugs to treat high BP in children. More than half used diuretics, but β -blockers, ACE inhibitors, and calcium antagonists also were prescribed for children.

The NCEP guidelines had not yet been widely disseminated at the time of the 1988 survey. Because this second survey was conducted in 1995, one might have expected the current practice to be more in accord with the NCEP Expert Panel recommendations for screening in children from high-risk families.³ Yet, there appears to be a trend toward less cholesterol measuring in high-risk children, particularly by FP and GP physicians, a third of whom did not perform cholesterol screening. On the other hand, there appears to be somewhat greater use of drugs for cholesterol treatment in children: 15.8% vs 12% (based on the more conservative approach used to establish the two proportions.) Hence, the relative rate of pharmacologic therapy for elevated cholesterol in children has actually increased in the presence of less screening. The BP guideline was updated in 1996, which continued to emphasize the importance of nonpharmacologic therapy as the first step for managing elevated BP.⁶ There was somewhat less use of low-sodium diet and weight reduction in 1995 compared with 1988. However, the overall prevalence of the use of antihypertensive medication also was lower in 1995.

Despite the current heightened awareness of the importance of modifying CHD risk factors in the US population, including children, the 1995 survey suggests that there are several areas of clinical practice and physician knowledge and attitudes that would benefit from additional educational efforts. For instance, the selection of pharmacologic agents to manage blood cholesterol and BP does not appear to be in conformance with the current guidelines for children. The popular use of statin drugs as lipid-lowering agents is of concern, particularly because they have not yet been approved by the FDA for general clinical use in children. The frequent use of statins by FP and GP physicians may be, in part, attributable to their unfamiliarity with the national guidelines concerning cholesterol in children. The report by the NCEP Expert Panel on the cholesterol guidelines for children was published as a supplement issue of *Pediatrics*, an official journal of the American Academy of Pediatrics.³ A separate set of guidelines, which paralleled these, also was published in *Pediat-*

rics in 1992.⁴ Both guidelines recommended bile acid sequestrants as the first drug of choice if the initial trial of dietary therapy failed to lower the cholesterol level. The selection of bile acid sequestrants as the cholesterol-lowering drug prescribed most frequently by PD physicians may be attributable to their greater familiarity with the official recommendations for children. The use of antihypertensive drugs, such as calcium channel blockers, in children needs additional examination; the National High Blood Pressure Education Program Working Group on Hypertension Control in Children and Adolescents also cautioned against the use of calcium channel blockers in children.⁶

There also remains a sizable proportion of physicians who continued to express concern regarding screening for CHD risk factors and dietary modification in children. These lingering doubts may serve as barriers to a more active approach to screening and treatment of CHD risk factors in children. Credible scientific information needs to be disseminated to alleviate these concerns among primary care physicians if the societal goal is to promote greater screening and treatment. Despite the heightened awareness in the general public regarding cholesterol,³⁸ there still is room to improve the knowledge base of physicians. There does not appear to be a notable increase from 1988 in the proportion of physicians who listed the three major CHD risk factors, namely, elevated blood cholesterol, hypertension, and cigarette-smoking.

Another notable time trend is the lower physician response rate to a national survey such as this NHLBI survey. In the current climate of managed care and flux in the practice setting, it will be increasingly difficult to assess prevailing physician practice patterns. Paradoxically, as cost-containment issues become more prominent in the public debate, it is becoming more difficult to gather the very information that would aid in rational formulation of practice guidelines. Physician education should address the importance of participation in national surveys to better understand the practice of preventive medicine in the primary care physician's office.

In conclusion, a national survey of primary care physicians indicates that there is no appreciable difference between 1988 and 1995 in the primary care physicians' approach to the detection and treatment of the major CHD risk factors in children. Compared with PD physicians, FP and GP physicians are more prone to use drugs, which is more appropriate for treating adults. This practice difference may be, in part, attributable to the venue of information dissemination. Both the national recommendations for high blood cholesterol and BP were published in *Pediatrics*, a journal not likely to be read by busy FP and GP physicians. As in our conclusions in the 1988 survey report, we strongly recommend that new information on risk-factor management needs to be channeled via multiple channels of physician communication and should not be confined solely to pediatric journals.³⁴

The lack of a notable time trend during the past 7 years suggests that the actual practice pattern does

not appear to be affected dramatically by the publication of expert panel recommendations, such as the NCEP guidelines for children, in a pediatric journal. If additional inroads in preventive cardiology are to be made, a concerted multiprong approach needs to be made, including undergraduate medical school education, continuing medical education, and publications in general readership as well as in relevant primary care journals. Additionally, more research is needed to increase the information base on the safety and efficacy of preventive measures and pharmacologic therapies for children in reducing risk factors for CHD.

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