Physician Noncompliance With the 1993 National Cholesterol Education Program (NCEP-ATPII) Guidelines

Joseph P. Frolkis, MD, PhD; Stephen J. Zyzanski, PhD; Jonathan M. Schwartz, MBA; Pamela S. Suhan, RN, MBA

Background—We sought to determine the frequency with which physicians follow National Cholesterol Education Program (NCEP-ATPII) guidelines in screening for cardiovascular risk factors and treating hyperlipidemia.

Methods and Results—We conducted a retrospective chart review on randomly sampled charts of 225 patients admitted to the coronary care unit between January and June 1996. The main outcome measures were rates of physician screening for coronary heart disease risk factors; rates of counseling for cigarette cessation, diet, and exercise; and extent of use of NCEP algorithms for obtaining LDL cholesterol values and treating hypercholesterolemia. Screening rates for interns (who performed best) were: cigarette use (89%), known coronary heart disease (74%), hypertension (68%), hyperlipidemia (59%), family history (56%), diabetes (37%), postmenopausal hormone therapy (11%), and premature menopause (1%). Four percent of smokers were counseled to quit, 14% of patients were referred to dietitians, and 1% were encouraged to exercise. A full lipid panel was obtained in 50% of patients in whom it was indicated on the basis of NCEP criteria. Patients were more likely to receive lipid-lowering treatment if NCEP criteria indicated that they should, but 36% of hospitalized patients and 46% of patients who should have been treated on discharge were not.

Conclusions—Physicians are poorly compliant with NCEP guidelines for risk factor assessment and counseling, even in patients at high risk for coronary heart disease. Physicians follow NCEP-ATPII algorithms for obtaining an LDL value, a key step in evaluating the need for treatment, only 50% of the time. NCEP criteria seem to influence the decision to initiate lipid-lowering therapy, but significant numbers of eligible patients remain untreated. (Circulation. 1998;98:851-855.)

Key Words: lipoproteins • risk factors • practice guidelines • compliance

Coronary heart disease (CHD) continues to be the leading cause of mortality in the United States, causing 500,000 deaths annually and costing the country $100 billion yearly. Unfortunately, ≈50% of myocardial infarctions occur in patients without prior manifestations of disease, and about one third are fatal. Aggressive management of risk factors has a significant positive impact on the natural history of atherosclerotic cardiovascular disease. Whereas age, sex, and family history are fixed, the modifiable risk factors of hypertension, cigarette smoking, diabetes, depressed HDL cholesterol levels, and elevated LDL cholesterol levels are responsible for a significant proportion of CHD cases and are amenable to medical intervention.

In the case of cholesterol, compelling data provide evidence that aggressive lipid-lowering therapy prevents recurrent cardiac events and lowers total mortality in patients with significant hyperlipidemia and known CHD, in those with elevated cholesterol and no prior heart attack, and in those with coronary disease but only mildly elevated levels of total cholesterol and LDL cholesterol. The benefits of lipid lowering in these studies apply to both men and women, to those older and younger than 55 years of age, and to diabetic individuals. The data also demonstrate significant reductions in the frequency of strokes and in the need for bypass procedures and angioplasties. Total number of hospital admissions, total days in the hospital, and average length of stay all decreased as well.

The effectiveness of aggressive risk factor assessment and control in altering subsequent cardiovascular morbidity and mortality led the National Cholesterol Education Program’s Adult Treatment Panel (NCEP-ATP) to issue its initial guidelines for the detection, evaluation, and treatment of hyperlipidemia in 1988 (NCEP-ATPI). In 1993, updated guidelines were issued (NCEP-ATPII). Among other changes, NCEP-ATPII recognized the significant risks of cardiovascular morbidity and mortality in postmenopausal women and in both men and women with documented CHD. By combining an assessment of the patient’s risk factor status with current lipid levels, the NCEP created logical algorithms to assist physicians in initiating appropriate treatment.

Despite the comprehensive nature and wide dissemination of NCEP-ATPII, a number of studies published between

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the 1988 and 1993 reports documented that patients continued to be underscreened and undertreated for cardiovascular risk factors, especially hyperlipidemia. One recent study of postmenopausal women enrolled after the publication of NCEP-ATPII suggested persistent deficits in adherence to treatment goals. Few other trials, however, have evaluated the impact of the updated NCEP guidelines on physician behavior. To ascertain the extent to which physicians were following NCEP guidelines in assessing CHD risk factors and initiating treatment for hyperlipidemia, we conducted a retrospective chart review of 225 patients admitted in 1996 to the coronary care unit (CCU) of a university-affiliated teaching hospital. We also evaluated the effect of patient demographic variables on treatment frequency.

Methods

Sample Selection
Using a sampling fraction based on an initial random number, we selected 225 charts for review. This sample represented approximately one third of all patients admitted to the CCU of a university-affiliated teaching hospital between January and June 1996. By sampling over an extended period of time, we hoped to offset the influence of any particular house officer, cardiology fellow, cardiology attending physician, or primary care physician.

Data Collection
An instrument was created, then refined after pilot testing, to allow consistent and uniform review of each patient record. Patient demographic and clinical variables and healthcare provider markers were collected for each admission. Patient demographic variables included age, sex, race, median household income, and type of insurance. Patient clinical variables included discharge diagnoses, lipid values (and whether or not these values were obtained as part of an admission chemistry profile or through a fasting lipid profile), and the presence or absence of the accepted NCEP risk factors (personal history of coronary or other atherosclerotic vascular disease, hypertension, diabetes, cigarette use, family history of premature CHD, and menopausal status and presence or absence of hormone replacement therapy for women). To establish a true incidence of each risk factor, discharge International Codes of Diagnosis-9 (ICD-9) were used alone for the presence of CHD, hypertension, and diabetes. For the risk factors of premature menopause without hormone replacement therapy and family history of premature CHD, each risk factor was considered present if it was documented in any note by any practitioner (including nurses). For current cigarette smoking, a combination of discharge ICD-9 codes and chart documentation by any practitioner was used. For each level of training (intern, resident, cardiologist, primary care physician, and nurse), healthcare provider variables included whether each risk factor had been screened for, the mean and median number of risk factors screened for, and whether counseling had been offered concerning cigarette cessation, dietary referral, and exercise. In the CCU, separate work-ups, examinations, and notes are mandatory on each admission for interns, residents, and primary nurses. Additionally, because a cardiologist consults on every patient, there is a formal cardiology note on each chart. Finally, the primary care physician is expected to write a note for each patient within 24 hours of admission.

Descriptive and analytical statistics were used in the analysis of these data. For categorical variables, basic descriptive statistics are reported as numbers and percentages. For continuous data, the descriptive statistics reported included means and standard deviations. In the first phase of analysis, descriptive statistics were used to describe the demographics of the sample, as well as the distribution of coronary heart disease risk factors. χ² statistics were then used to test for associations between the patient’s demographic profile and the presence and type of lipid-lowering therapy provided in the hospital or at discharge. Differences in lipid profiles by the presence and type of lipid-lowering therapy were tested by 1-way ANOVA. Finally, χ² analyses relating type of therapy and therapeutic indication were performed on the subset of patients (n=96) who had lipid panels drawn.

Results
Salient demographic characteristics and the frequency of the clinical conditions constituting the NCEP risk factors in the study population are presented in Table 1. The racial and insurance characteristics of the sample reflect the location of the hospital in an urban area with a high concentration of indigent and black citizens. The prevalence of CHD risk factors, including the existence of documented CHD in nearly two thirds of the population, establishes the high-risk nature of these patients admitted to the CCU, a group in whom aggressive risk factor assessment and intervention should produce the greatest clinical benefit.

In Table 2, the frequency with which each practitioner group inquired about each of the NCEP risk factors is presented. Age and sex are not indicated as risk factors because they represent data readily available to all practitioners and do not require independent inquiry. Interns performed best, as might be anticipated because they are expected to take the most thorough admission history from patients, but even interns inquired about only 2 risk factors (known CHD and cigarette smoking) >70% of the time. Rates of risk factor assessment decrease sharply when house officers (interns and residents) are compared with primary physicians, cardiologists, and nurses. Rates of inquiry about diabetes, premature menopause, and current hormone replacement therapy were particularly low. The mean number of risk factors screened for by each practitioner is also calculated. Of the 8 possible risk factors, interns screened for
3.3, residents for 3.0, primary physicians for 1.9, cardiologists for 1.8, and nurses for 2.3.

To evaluate how well practitioners followed up on the risk factors discovered during screening, 3 variables were selected, and charts were reviewed to determine whether any practitioner had offered patients counseling or referral. Of the 71 patients who smoked cigarettes, only 3 (4%) were counseled to quit. Only 1 patient (1%) was encouraged to exercise, and only 32 patients (14%) were referred to a dietitian.

We examined the influence of NCEP-ATPII not only on how aggressively physicians screened for CHD risk factors but also on how they made clinical decisions to evaluate further a patient’s lipid status and to initiate appropriate lipid-lowering therapies. To begin, we evaluated the relationship between the nonclinical patient demographic variables of insurance type, sex, race, and median household income and whether not patients were offered lipid-lowering therapy while in the hospital or at CCU discharge. In this sample, the selected demographic variables bore no statistical relationship to the decision to initiate lipid-lowering therapy either during hospitalization in the CCU or at discharge.

We next turned our attention to clinical factors that might influence physician behavior. First, we examined the relationship between serum lipid values and whether cholesterol-lowering therapy was offered either during hospitalization or at discharge. Lipid values included total cholesterol (TC) obtained as part of a chemistry panel, as well as values from a specifically requested fasting lipid panel (FLP). TC levels from a chemistry panel (P < 0.001), TC levels from an FLP (P = 0.004), and LDL cholesterol levels (P = 0.002) were strongly associated with the administration of lipid-lowering medication while the patient was in the CCU. Similarly, TC levels from a chemistry panel (P < 0.001), TC levels from an FLP (P = 0.006), and LDL levels (P = 0.002) predicted the prescription of lipid-lowering therapies on discharge from the CCU. HDL cholesterol and triglyceride levels were unrelated to therapeutic intervention either during hospitalization or at discharge.

NCEP treatment algorithms are not based purely on lipid values, however. Instead, the combination of TC level, HDL cholesterol level, and risk factor count are used to trigger the request for an FLP, which provides an LDL level that can then be used to make therapeutic decisions. Specifically, NCEP criteria for obtaining an FLP include the presence of documented CHD, a TC level ≥ 240 mg/dL, or a TC level of 200 to 239 mg/dL and either ≥ 2 risk factors or an HDL level < 35 mg/dL. In the setting of the present study, however, an HDL value was only obtained as part of an FLP. Thus, when an HDL value was obtained, an LDL value was automatically provided as well, invalidating the use of the HDL level alone, as intended in the NCEP algorithm. We therefore constructed a Statistical Package for Social Science algorithm that omitted HDL values but included the other NCEP criteria, as previously outlined. The results showed that when an FLP was not indicated by NCEP guidelines, it was not obtained 76% of the time. In contrast, when NCEP guidelines indicated that an FLP should be obtained, there was only a 50% chance that it would be. These contrasts are statistically significant.

Based on NCEP guidelines, the decision to initiate lipid-lowering therapy is linked to the level of LDL cholesterol, the risk factor count, and the presence or absence of documented CHD or other atherosclerotic disease. Accordingly, a Statistical Package for Social Science algorithm was created that used NCEP criteria for LDL values and risk factor count. The analysis was performed only on those patients for whom an FLP had been obtained. For patients who met NCEP criteria for lipid-lowering medication, Table 3 shows the percentage of those who did and did not receive therapy on admission, during hospitalization, or at discharge. NCEP guidelines did

### TABLE 2. Practitioner Risk Factor Screen Performance

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Intern</th>
<th>Resident</th>
<th>Primary MD</th>
<th>Cardiologist</th>
<th>Nurse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Known CHD</td>
<td>74</td>
<td>76</td>
<td>65</td>
<td>71</td>
<td>53</td>
</tr>
<tr>
<td>Family history of premature CHD</td>
<td>56</td>
<td>39</td>
<td>19</td>
<td>11</td>
<td>0.5</td>
</tr>
<tr>
<td>Hypertension</td>
<td>68</td>
<td>70</td>
<td>50</td>
<td>49</td>
<td>52</td>
</tr>
<tr>
<td>Current smoking</td>
<td>89</td>
<td>72</td>
<td>37</td>
<td>26</td>
<td>87</td>
</tr>
<tr>
<td>Diabetes</td>
<td>37</td>
<td>37</td>
<td>21</td>
<td>22</td>
<td>24</td>
</tr>
<tr>
<td>Premature menopause</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Postmenopausal hormone therapy</td>
<td>11</td>
<td>9</td>
<td>0</td>
<td>7</td>
<td>16</td>
</tr>
<tr>
<td>Hyperlipidemia</td>
<td>59</td>
<td>58</td>
<td>31</td>
<td>37</td>
<td>8</td>
</tr>
</tbody>
</table>

Values are expressed as percent.

### TABLE 3. Actual Therapy Vs NCEP-Indicated Therapy for Patients

<table>
<thead>
<tr>
<th></th>
<th>No Drugs</th>
<th>Drugs</th>
<th>P*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admission</td>
<td></td>
<td></td>
<td>0.25</td>
</tr>
<tr>
<td>n</td>
<td>60</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>No drugs</td>
<td>80%</td>
<td>86%</td>
<td></td>
</tr>
<tr>
<td>Drugs</td>
<td>20%</td>
<td>14%</td>
<td></td>
</tr>
<tr>
<td>Hospital</td>
<td></td>
<td></td>
<td>0.005</td>
</tr>
<tr>
<td>n</td>
<td>65</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>No drugs</td>
<td>72%</td>
<td>39%</td>
<td></td>
</tr>
<tr>
<td>Drugs</td>
<td>28%</td>
<td>61%</td>
<td></td>
</tr>
<tr>
<td>Discharge</td>
<td></td>
<td></td>
<td>0.02</td>
</tr>
<tr>
<td>n</td>
<td>65</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>No drugs</td>
<td>74%</td>
<td>48%</td>
<td></td>
</tr>
<tr>
<td>Drugs</td>
<td>26%</td>
<td>52%</td>
<td></td>
</tr>
</tbody>
</table>

All probabilities are derived from χ² statistics.

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not predict whether patients were receiving lipid-lowering therapy at the time of their admission. On the other hand, patients were more likely to receive hospital therapy and discharge therapy if NCEP guidelines suggested that it was appropriate. However, a significant number of patients for whom hospital therapy or discharge therapy was indicated by NCEP criteria remained untreated.

To determine whether patients with CHD were treated differently in the CCU, we examined the data presented in Table 3 separately for those patients who had documented CHD, had an FLP obtained, and were drug-eligible by NCEP-ATPII criteria. Of this group, 14% (3/21) received lipid-lowering medication on admission, 62% (13/21) had it prescribed during hospitalization, and 52% (11/21) were offered such treatment on discharge. We next asked 3 related questions that were slightly broader in scope: (1) Independent of NCEP status, what percentage of patients who received lipid-lowering medication had CHD? (2) What percentage of CHD patients received medication? and (3) What percentage of CHD patients received lifestyle advice concerning diet and exercise? During hospitalization, 85% (58/68) of patients who received lipid-lowering medication had CHD. Of patients who received lipid-lowering medication had CHD? (2) What percentage of CHD patients received medication? and (3) What percentage of CHD patients received lifestyle advice concerning diet and exercise? During hospitalization, 85% (58/68) of patients who received lipid-lowering medication had CHD. Of patients who received lipid-lowering medications on discharge, 85% (56/66) had CHD. Of CHD patients, 41% (58/143) received medication during hospitalization and 39% (56/143) received medication on discharge. Of CHD patients, 30% (43/143) were given lifestyle advice.

Finally, although this study was not designed to document postdischarge follow-up, we were curious as to the frequency with which follow-up was offered. For the study population as a whole, 91% (204/223) of patients were discharged with a follow-up appointment.

**Discussion**

Our results indicate that despite the widespread availability of the NCEP-ATPII recommendations for the detection, evaluation, and treatment of hyperlipidemia and the highly publicized results of recent major clinical trials of both primary and secondary prevention of CHD,1–3 physician implementation of risk factor assessment, lifestyle counseling, and appropriate use of therapeutic algorithms remains inadequate. Using only the performance of medical interns, we compared our data with those of Miller et al4 for 258 cases admitted for coronary artery bypass surgery (Table 4). No significant impact of NCEP-ATPII was seen on physician performance.

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CHD is the leading cause of death in American women >50 years of age, with CHD incidence for women reaching and then surpassing that for men as women move into the postmenopausal years. These data led the NCEP panel to include being a woman aged ≥55 years or having had premature menopause and not being on hormone replacement therapy as an official risk factor for CHD. It was therefore particularly disheartening that when questioning female patients, physicians inquired about premature menopause only 1 to 3% of the time and about hormone replacement therapy only 7 to 11% of the time.

Risk factor status, including the presence of documented CHD, and lipid values constitute the criteria for clinical decision making according to the NCEP guidelines. We sought to examine whether and to what extent physicians were adhering to NCEP-guided algorithms in the care of their patients. If physicians were not using NCEP criteria, we hoped to discover what factors did influence their behavior. Numerous studies, for example, have shown the relationship of demographic variables to health outcomes, from the underutilization of coronary revascularization procedures based on race11 to the impact on total mortality of socioeconomic status.12 In the present study, race, sex, median household income, and type of medical insurance had no impact on whether patients received lipid-lowering therapy while in the hospital or at discharge. For a population as demographically heterogeneous as ours (see Table 1), this negative finding was reassuring.

Lipid values per se clearly influenced the decision to begin lipid-lowering therapy. It is difficult to assess the intentionality of the TC value reported automatically with a chemistry panel. Of the sample, 198 (90%) had an admission chemistry panel ordered (for which individual tests do not have to be specified). For both in-hospital and discharge lipid-lowering therapy, chemistry panel TC levels were correlated. AN FLP was ordered for 96 (44%) of patients. The values for TC and LDL cholesterol, but not triglycerides or HDL, were correlated with the receipt of lipid-lowering therapy both in the hospital and at discharge. Physicians obviously incorporated lipid values into their decision making. Lipid values, however, must be used in combination with risk factor status to follow NCEP algorithms. Lipid values alone may not be a valid surrogate for the criteria used in the first 2 steps of the NCEP pathway (TC, HDL, and risk factors to determine need for an FLP; LDL value and risk factors to initiate therapy). In fact, when we compared the NCEP-driven indications for either obtaining an FLP or beginning therapy with TC and LDL cholesterol levels, we found no statistical correlation (data not shown). Although physicians seem to use TC and LDL cholesterol levels to make decisions about treatment, these levels are not valid markers for NCEP-guided criteria for such decisions. Additionally, our data call into question whether physicians are following the logical, orderly progression of clinical decision making inherent in the NCEP guidelines. AN FLP is obtained only 50% of the time when the combination of TC level and risk factor status suggests that it should be. Because this is the key initial step that

<table>
<thead>
<tr>
<th>TABLE 4. Risk Factor Identification by Medical Interns</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Maryland (1992)</td>
</tr>
<tr>
<td>--------------------------------</td>
</tr>
<tr>
<td>Hypertension</td>
</tr>
<tr>
<td>Cigarettes</td>
</tr>
<tr>
<td>Diabetes</td>
</tr>
<tr>
<td>Family history of premature CHD</td>
</tr>
<tr>
<td>Hyperlipidemia</td>
</tr>
</tbody>
</table>

Values are percentages.
ultimately leads to any decision to begin treatment (diet or drug), the fact that only half of eligible patients have an FLP points to significant underscreening in this high-risk group.

Our separate analyses of patients with documented CHD demonstrate that despite recent exhortations,13,14 physicians in this study are no more likely to treat such patients than the study population as a whole. This is particularly discouraging because there is widespread agreement on the value of aggressive lipid lowering in secondary prevention, with some even arguing14 that cholesterol screening itself is unnecessary in CHD patients because the presence of their disease is de facto proof that the level is too high.

The present study has several limitations. We considered that our conclusions are based on documented risk factor screening and health counseling and that physicians might actually have been more thorough than is noted in the hospital chart. However, for both managed care quality assurance and malpractice functions, what is documented is increasingly considered a valid substitute for what is actually asked or done. Physicians at all levels are encouraged to keep careful and updated chart notes. Additionally, in at least 1 study,15 this question was addressed by performing a subanalysis in which the recorded risk assessment was compared with direct verbal questioning of patients about their risk assessment. Except for a slight underreporting of smoking and sedentariness, the medical record was an accurate reflection of actual risk assessment. Finally, for health counseling about cigarettes, weight, and exercise, our criteria were quite generous in that we considered any reference in any note by any practitioner to constitute counseling.

Because we only reviewed records of patients’ stays in the CCU, we may have underestimated the frequency with which lipid-lowering therapy was begun after hospital discharge. Although we cannot estimate the eventual postdischarge rate of therapy, 2 points may be made. First, CCU admission of a high-risk patient is considered an ideal time to initiate therapy, which can then be titrated or “fine-tuned” in follow-up. Clearly, some patients were begun on therapy, so aversion to in-hospital treatment seems not to be the issue. Second, considerable data suggest that fewer than one third of eligible patients receive any lipid-lowering therapy (including diet).7 Therefore, it is dangerous to assume that therapy will be initiated after discharge. In response, a number of programs are advocating aggressive, comprehensive risk factor assessment and treatment before discharge.

Some concern may exist that treatment rates were depressed because cholesterol values were transiently lowered by the acute-phase response known to affect all lipid subfractions within several hours of a number of stressors (eg, burns, trauma, surgery, and myocardial infarction). In our study population, not all patients were confirmed to have had myocardial infarctions; if they underwent bypass surgery or balloon angioplasty, lipid values were obtained beforehand. More important, our most striking findings concerning therapeutic decision making were based on these potentially lowered lipid values applied to strict NCEP criteria. Even based on possibly artificially lowered lipid values, only 50% of eligible patients had an FLP and one third to one half of eligible patients were untreated.

In summary, our data suggest that despite the NCEP-ATPII guidelines, risk factor assessment and counseling remain inadequate, even for patients at high risk of CHD. Physicians in our sample did not seem to be influenced by demographic characteristics in making clinical decisions about lipid-lowering therapy, which was a positive finding. They did seem to be influenced by isolated TC and LDL cholesterol levels, which are questionable surrogates for NCEP-directed care. Physicians seem to follow NCEP guidelines for initiating therapy, but significant numbers of eligible patients remain untreated. Finally, NCEP guidelines do not seem to influence whether physicians ascertain a patient’s LDL level, the key NCEP datum in evaluating the need for treatment.

Acknowledgments

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References

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