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Long-term effect of nutritional counseling: a study in family medicine\textsuperscript{1,2}

\textit{J Carel Bakx, Annette Staffleu, Wija A van Staveren, Henk JM van den Hoogen, and Chris van Weel}

**ABSTRACT** This paper reports research using data in the Nijmegen Family Practice Monitoring Project. One part of the research is follow-up, after 17 y, of a 1977 trial of dietary advice for patients with hypertension or a family history of premature cardiovascular disease. In the intervention group, 840 patients were given health education every 2 mo by trained practice nurses for 1 y. There were 497 patients with similar coronary risk factors in the control group, who received usual care. One year after the intervention a significant decrease was found (published) in serum cholesterol concentrations and blood pressure in the intervention group. By the time of the 1995 reexaminations, however, there were no differences in coronary risk factors between the two groups. Blood pressures had come down, more so in the control group, and the percentage of smokers had decreased equally in both groups. There were no significant differences in intake of dietary fat or in type of fat. The lack of difference was still found when the groups were divided into those with serum cholesterol concentrations \( \geq 6.5 \) mmol/L and \(< 6.5 \) mmol/L. A second part of the research was to investigate in 1995 the relation between patients' stage of change of fat intake and their dietary intake. It was found that those in stage 5 (sustaining desired changes in behavior) had the lowest saturated fat intake. Since 1977 both groups have been treated equally if hypertension was diagnosed. The two groups were not managed differently with regard to dietary advice after 1977. *Am J Clin Nutr* 1997;65(suppl):1946S–50S.

**KEY WORDS** Fat intake, general practice, dietary behavior, cardiovascular risk factors, hypertension

**INTRODUCTION**

Nutritional advice is one of the cornerstones of primary and secondary prevention of cardiovascular diseases. Promotion of healthy food in the general population aims at lowering the development of atherosclerosis. Subjects with an established elevated risk of cardiovascular disease, among others, are counseled to change their fat intake. The objective of this counseling is to slow down or postpone the development of atherosclerosis; ie, secondary prevention. Secondary prevention of cardiovascular disease requires a person-to-person approach over a long time, and this form of prevention has been promoted in the personal care that is a part of family practice. Nutritional advice in the secondary prevention of cardiovascular disease can be directed at lowering intake of saturated fat and increasing intake of polyunsaturated fat to reduce blood cholesterol concentrations, at lowering energy intake to reduce body mass, and at restricting salt intake to lower blood pressure.

To be effective, interventions should be maintained over a long period of time. For smoking cessation, long-term outcomes of intervention in general practice have been disappointing (1, 2). Dietary advice concerning weight reduction as well as of hypertension has proved to be effective, but little is known of the long-term effect of nutritional advice to lower blood lipid concentrations. In short-term intervention studies a significant decrease in low-density-lipoprotein (LDL) cholesterol was found with both a diet with low total fat and a diet with reduced saturated fat compensated by increased unsaturated fat (3). Changes in serum lipid concentrations were similar to those seen with cholesterol-lowering drugs.

Strandberg et al (4) found no differences in risk factors between intervention and control groups 5 y after a trial, although at the end of the trial all risk factors were significantly lower in the intervention group. Treatment of hyperlipidemia as well as of hypertension has proved to be effective, but there is no evidence of effectiveness between antihypertensive and antihypertensive therapy in primary care settings and the benefits reported in randomized trials (5, 6). In many patients in general practice, hyperlipidemia and hypertension are controlled inadequately (7). It can be assumed that an important factor in success is an individual's perceived need to change his or her nutrition habits. This perception can be evaluated by determining a patient's stage of change, which ranges from precontemplation to maintenance (8, 9).

The aim of the present study was to assess the long-term effect of nutritional advice after screening for cardiovascular risk. Blood cholesterol concentrations and stages of change were measured in two groups of patients, 17 y after their participation in a primary care–based screening: a group with an elevated risk at the initial screening and a group with low-normal risk at the initial screening.

**DESIGN AND RESEARCH PROCEDURES**

Plasma cholesterol, stage of change, smoking status, body weight, and blood pressure were measured in 1994–1995 in subjects who had taken part in a family practice–based screen-

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The 1977–1978 screening

The screening in 1977–1978 took place in six practices in the Nijmegen region. In the period from 1 February 1977 until 1 February 1978 all patients between 20 and 50 y of age who visited their doctor were invited for screening. The whole population consisted of 10 284 patients. The screening was performed by specially trained practice nurses and consisted of a medical and family history on cardiovascular diseases; smoking was assessed with use of a standard questionnaire. Body weight was measured without shoes on a balance scale; blood pressure was measured with a mercury sphygmomanometer. Systolic blood pressure (SBP) and diastolic blood pressure (DBP) were measured twice on the right arm with the patient sitting after a rest period.

Serum cholesterol concentration was measured with the Liebermann-Burchard reagent, with Huang modification, at the laboratory of the Wageningen Agricultural University. The laboratory took part in the Cooperative Cholesterol Standardization Program of the World Health Organization with the Center for Research in Blood Lipids in Atlanta as a reference.

A cardiovascular risk profile was drawn for every participant and those with elevated risk were referred to their family physician. The criteria for the risk profile were derived from the Coronary Risk Handbook, developed by the American Heart Association (11), without the criteria for electromyogram abnormalities. Hypertension was defined as SBP > 160 or DBP > 95 mm Hg or both in men aged < 40 y, SBP > 160 or DBP > 100 mm Hg or both in men ≥ 40 y, SBP > 180 or DBP > 100 mm Hg or both in women aged < 40 y, and SBP > 180 or DBP > 105 mm Hg or both in women aged ≥ 40 y.

A family history of cardiovascular disease (cardiovascular disease before the age of 65 y in first-degree relatives) with borderline hypertension was also a reason for intervention. Borderline hypertension was defined in men as SBP between 140 and 160 or DBP between 90 and 95 mm Hg or both in men aged < 40 y and SBP between 140 and 160 or DBP between 96 and 100 mm Hg or both in men aged ≥ 40 y. For women, borderline hypertension was defined as SBP between 160 and 180 or DBP between 95 and 100 mm Hg or both in women aged < 40 y and SBP between 160 and 180 or DBP between 100 and 105 mm Hg or both in women aged ≥ 40 y.

The six practices were randomly divided into four intervention and two control practices. The 20% of all participants with the highest risk scores were invited to participate in the intervention in these four practices. In the intervention practices, family physicians received support for 1 y in the follow-up of the identified high-risk patients. Patients were given health education every 2 mo by trained practice nurses, whereas the control family physicians prescribed unsupported advice. Thus, the intervention compared the outcome of cardiovascular risk in high-risk patients under supervised care with outcome in high-risk patients under usual care.

After this intervention study, all practices received computer-assisted monitoring in 1982 of the follow-up of their patients with hypertension and later with diabetes. All cardiovascular events were registered. This developed into the Nijmegen Monitoring Project network of the Department of Family and Social Medicine.

The 1994–1995 rescreening

In 1994–1995 the long-term outcome of the 1977–1978 screening and intervention was studied. The first step was to establish whether participants of the screening were still alive and lived in the practice area. The files of patients who had died were studied for cause of death, and for patients who had moved to another area, their new family physician was contacted to establish their current health status.

The subjects still living in the practice area were considered for the follow-up study. All with an elevated cardiovascular risk at the 1977–1978 screening were invited, as were a random 20% sample of those with a low-normal cardiovascular risk at that time. The following information was collected at the rescreening. 1) Cardiovascular events since 1977 were recorded based on the computerized practice records. 2) Smoking status, body mass index, and blood pressure were measured as in 1977. 3) Nonfasting serum cholesterol concentrations were measured with the enzymatic method at the laboratory of the Canisius Wilhelmina Hospital at Nijmegen. The quality control standards of the national laboratory foundation were met. The internal quality control data of the laboratory were analyzed to detect laboratory drifts. 4) Fat intake and dietary attitude were measured in the local family practice by trained research assistants. The questionnaire used assessed fat intake and the patient’s attitude toward fat intake and the barriers in changing toward consumption of healthy foods. Patients’ attitudes toward fat intake were established by use of a stage-of-change algorithm. The short questionnaire defines an individual’s stage of dietary fat reduction and has been validated (13, 14). The stage-of-change model is a dynamical model that classifies behavior into five stages: precontemplation (not yet considering the behavioral change of interest), contemplation (considering change), preparation (actually planning change), action (actively changing), and maintenance (sustaining the desired changes in behavior).

Analysis

Current fat intake and stage of dietary change were treated as independent variables and blood cholesterol in 1995 was the dependent variable. Correlations were assessed between fat intake and 1) serum cholesterol concentrations and 2) stage of change in dietary attitudes. Correlations were also computed between the stage of dietary change and serum cholesterol concentrations. The SAS program (SAS Institute, Inc, Cary, NC) was used for analysis.

RESULTS

The study population in 1977 by age and sex is shown in Table 1. A total of 7092 patients participated in 1977 (68.9% of the total population invited for screening). At the basic
TABLE 1
Study population in 1977 by age and sex

<table>
<thead>
<tr>
<th></th>
<th>Men (n = 3404)</th>
<th>Women (n = 3688)</th>
<th>Total (n = 7092)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20–29 y</td>
<td>987</td>
<td>1207</td>
<td>2194</td>
</tr>
<tr>
<td>30–39 y</td>
<td>1384</td>
<td>1401</td>
<td>2785</td>
</tr>
<tr>
<td>40–49 y</td>
<td>1033</td>
<td>1080</td>
<td>2113</td>
</tr>
</tbody>
</table>

TABLE 2
Mean value of coronary risk factors in high-risk subjects in the intervention and control groups in 1977 and 1995

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Intervention group (n = 360)</th>
<th>Control group (n = 112)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum cholesterol (mmol/L)</td>
<td>6.3 ± 1.13</td>
<td>6.5 ± 1.10</td>
</tr>
<tr>
<td>DBP (mm Hg)</td>
<td>88.5 ± 10.1</td>
<td>85.0 ± 10.6</td>
</tr>
<tr>
<td>SBP (mm Hg)</td>
<td>144.0 ± 16.5</td>
<td>142.0 ± 19.8</td>
</tr>
<tr>
<td>Smoking (%)</td>
<td>60.0</td>
<td>33.6</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>25.4 ± 3.2</td>
<td>27.1 ± 4.1</td>
</tr>
</tbody>
</table>

* p ≤ SE. Mean age of both groups was 56 y (range: 39–68 y). DBP, diastolic blood pressure; SBP, systolic blood pressure.

screening the high-risk group consisted of 840 subjects in the intervention group and 497 subjects in the control group. In 1995 there were 938 subjects alive, 630 of the intervention group and 308 of the control group. Seventy-six subjects died and 323 had moved from the practice area.

As shown in Table 2, except for blood pressure, mean values for the coronary risk factors did not differ significantly between the intervention and control groups. Systolic and diastolic blood pressure decreased more in the control group than in the intervention group, but patients in the control group had higher blood pressures at the 1977 screening.

Dietary fat intake, measured with the questionnaire, is shown in Table 3. There was no difference in mean fat intake between the two groups. To see whether there was a relation between fat intake and serum cholesterol, we compared fat intake with serum cholesterol for different groups. The cholesterol guidelines of the Dutch College of General Practitioners advise treatment at a serum total cholesterol concentration of 6.5 mmol/L as the cutoff. Fat intake and serum cholesterol concentrations in 1977 for the intervention and control groups are shown in Table 4. There was no relation between high and low blood cholesterol in the intervention and control groups as measured in 1977 and fat intake in 1995, despite the intervention in the high-cholesterol intervention group in 1977.

To look for an influence of nutrition counseling on dietary behavior we investigated the relation between high blood cholesterol in 1977 and the stage of change in 1995. There was no relation between intervention and control groups and the stage of change for either high or low blood cholesterol.

To determine the consequences of our findings for general practice, we counted the proportion of patients who currently need special attention for their food habits. Dietary guidelines

TABLE 3
Mean fat intake (measured with the food-frequency questionnaire) and serum cholesterol concentration in 1995

<table>
<thead>
<tr>
<th></th>
<th>Intervention group (n = 360)</th>
<th>Control group (n = 112)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fat (g)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>105.8 ± 12.5</td>
<td>39.2 ± 8.4</td>
</tr>
<tr>
<td>Saturated</td>
<td>32.0 ± 15.4</td>
<td>38.5 ± 13.5</td>
</tr>
<tr>
<td>Monounsaturated</td>
<td>35.9 ± 16.4</td>
<td>36.1 ± 15.1</td>
</tr>
<tr>
<td>Polyunsaturated</td>
<td>25.7 ± 11.9</td>
<td>22.2 ± 10.6</td>
</tr>
<tr>
<td>Fat (% of energy)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>38.5 ± 6.9</td>
<td>39.3 ± 7.8</td>
</tr>
<tr>
<td>Saturated</td>
<td>13.8 ± 2.7</td>
<td>14.7 ± 3.2</td>
</tr>
<tr>
<td>Monounsaturated</td>
<td>13.0 ± 3.2</td>
<td>13.7 ± 3.6</td>
</tr>
<tr>
<td>Polyunsaturated</td>
<td>9.4 ± 3.2</td>
<td>8.4 ± 3.1</td>
</tr>
<tr>
<td>Serum cholesterol (mmol/L)</td>
<td>6.5 ± 1.1</td>
<td>6.5 ± 1.3</td>
</tr>
</tbody>
</table>

* p ≤ SE.

TABLE 4
Mean fat intake in 1995 in relation to blood cholesterol in 1977 for the intervention and control groups

<table>
<thead>
<tr>
<th>Serum cholesterol low (&lt;6.5 mmol/L)</th>
<th>Serum cholesterol high (≥6.5 mmol/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervention group (n = 207)</td>
<td>Control group (n = 77)</td>
</tr>
<tr>
<td>Fat (% of energy)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>38.7 ± 6.9</td>
</tr>
<tr>
<td>Saturated</td>
<td>14.1 ± 2.9</td>
</tr>
<tr>
<td>Monounsaturated</td>
<td>13.2 ± 3.2</td>
</tr>
<tr>
<td>Polyunsaturated</td>
<td>9.1 ± 2.9</td>
</tr>
<tr>
<td>Fat (g)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>106 ± 45</td>
</tr>
<tr>
<td>Saturated</td>
<td>38.7 ± 16.6</td>
</tr>
<tr>
<td>Monounsaturated</td>
<td>36.5 ± 17.5</td>
</tr>
<tr>
<td>Polyunsaturated</td>
<td>24.7 ± 11.4</td>
</tr>
<tr>
<td>Mean serum cholesterol, 1977 (mmol/L)</td>
<td>5.5 ± 0.73</td>
</tr>
<tr>
<td>Cholesterol, 1995 (mmol/L)</td>
<td>6.1 ± 0.92</td>
</tr>
<tr>
<td>Percentage with cholesterol &gt; 6.5 mmol/L in 1995 (%)</td>
<td>36</td>
</tr>
</tbody>
</table>

* p ≤ SEM.
in Holland, as elsewhere in Europe, recommend reduction of fat intake to 30–35% of energy. In the whole high-risk group, 87 men of the 254 patients (34%) had a serum cholesterol concentration ≥ 6.5 mmol/L and a dietary intake of > 35% of energy as fat. In women, 68 of the 218 patients (31%) needed dietary advice. Only 25% of the total high-risk group had a dietary intake of <35% of energy as fat.

The relation between stage of change and fat intake is shown in Table 5. Energy intake was higher in men than in women. Fat intake differed among the stages of change: subjects in stage 1 of change had the highest fat intake and subjects in stage 5 the lowest. This relation was more clear for men. Energy and fat intakes of patients in stage 5 were different from intakes of patients in the other stages and this difference was significant in both men and women. The lack of correlation between the stage of change and high and low cholesterol concentrations in the intervention and control groups confirms that attitude to diet is not explained by the intervention in 1977.

## DISCUSSION

This study investigated the effect of nutritional counseling on cardiovascular risk factors 17 y after the intervention. No differences were found in serum cholesterol or fat intake between the intervention and control groups. One year after the intervention period a significant decrease had been found in serum cholesterol and blood pressure in the intervention group. Our findings in the present study agree with a 5-y follow-up in this cohort, in which no differences were found in cardiovascular risk factors between the intervention and control groups (15, 16).

The general practices in this study are involved in the Nijmegen Monitoring Project, in which continuous feedback is given to the practices on patients under treatment for hypertension and diabetes. It is to be expected that the lower blood pressures found in 1995 are an effect of this monitoring and treatment of hypertension. But this effect has been directed at small increase for patients not under treatment for hypertension and diabetes. It is to be expected that the lower blood pressure figures showed a greater decrease in blood pressure in patients under treatment for hypertension and a small increase for patients not under treatment for hypertension (data not shown).

For dietary advice there is no guideline in general practice. Despite intensive nutrition counseling in the intervention group, no difference in attitude between the two groups could be shown. The mean serum cholesterol concentration in both groups was higher than the mean in the Netherlands for that age group (17). A considerable number of patients (78% of the men and 70% of the women) who are at high risk for cardiovascular diseases had unfavorable fat intakes, although =20% of the patients answered that they had visited a dietitian in the past 17 y.

We know of no other study in family practice in which the stage-of-change measurement was included. Stage of change was an independent factor in predicting fat intake in patients who were at risk for cardiovascular disease. Subjects who were in the stage of maintenance of their dietary change had significantly lower fat intakes than did patients in other stages, especially patients in stage 1 (never thinking of changing diet behavior). In another study in general practice it was shown that tailored nutrition messages had a positive effect on promoting dietary changes (18). Patients who were in the stage of maintaining dietary change did remember the message more often than those in other stages. Not remembering the consequences of high blood cholesterol was accompanied by a more negative attitude toward changing the diet (19).

The only way to success seems to be behavioral change, as shown with the stage-of-change model. Nutritional advice should be more tailored. Before starting to change a patient’s diet, a judgment about attitude must first be gained. In contrast with the management of chronic diseases such as hypertension and diabetes for which the doctor has a greater influence by prescription of drugs, management of unfavorable diet habits requires another approach. Further investigation is needed to look for strategies to use in general practice to change attitudes toward dietary habits of patients who are at high risk for cardiovascular disease.

## REFERENCES