

Quality of secondary cardiovascular prevention in specialised care in the Netherlands: the SOLID study

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Objective. To determine the extent to which Dutch patients with a history of cardiovascular disease and high cholesterol levels, treated in specialised care, are achieving low-cholesterol targets as defined by national guidelines.

Design. Hospital-based cohort study.

Setting. Practices of 41 hospital-based cardiologists and internists in the Netherlands.

Subjects. 7377 patients.

Results. Forty-one percent of the patients with an indication for secondary cardiovascular prevention by lipid-lowering drug treatment were receiving medication and were achieving cholesterol targets, 42% were receiving lipid-lowering medication but had cholesterol levels above target, 11% were not receiving treatment, and 5% had no recent lipid measurements.

Conclusion. Compared with previous studies, the SOLID study shows that a relatively large percentage of the Dutch patients under specialised care with a history of cardiovascular disease and an indication for cholesterol-reducing therapy are currently being treated. A considerable proportion of the patients, however, are still not receiving optimal treatment and more than 10% are not being treated at all. (*Neth Heart J* 2004;12:3-6.)

Key words: Dutch guidelines, cardiovascular disease, high cholesterol levels

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Cardiovascular diseases are the leading cause of death in the world.¹ Over the past few decades, epidemiological studies have disclosed several risk factors that increase the risk of cardiovascular disease.² Some of these risk factors may be favourably modified by a change in lifestyle or through medication. One of the most important modifiable risk factors is the serum cholesterol level. Statins have provided a means of effectively reducing cholesterol levels and decreasing the incidence of cardiovascular disease.³⁻⁵ In various countries this has led to the development of evidence-based guidelines for cardiovascular prevention by means of treating elevated cholesterol levels.

In 1998, the Dutch Institute for Healthcare Improvement (CBO)⁶ issued guidelines for the 'Treatment and prevention of coronary heart disease (CHD) by reducing the plasma cholesterol concentration'. A distinctive feature of these guidelines is that they indicate precisely which patients with elevated cholesterol levels have an indication for treatment and which patients are not eligible for cholesterol-lowering therapy. The guidelines take into account both the scientific evidence and cost-effectiveness of the medication. Depending on the age of the patient, the guidelines indicate that those individuals whose ten-year risk of a myocardial infarction is 25% or higher will require cholesterol-lowering therapy when serum total cholesterol levels are elevated. This implies that treatment should be implemented for all patients with documented cardiovascular disease and a cholesterol level higher than 5.0 mmol/l (secondary prevention).

The extent to which the Dutch treatment guidelines and recommendations are currently implemented in clinical practice is unknown. Previous studies carried out in the Netherlands and other Western countries have suggested that a considerable number of patients eligible for therapy are not or not adequately treated.

The Study on the Implementation of Guidelines (SOLID) was designed to determine the extent to which patients with elevated cholesterol levels in the Netherlands are currently undertreated. Furthermore, differences in treatment between particular patient groups and between men and women are examined.

Table 1. Characteristics of the patients (n=7377).

Population	Baseline characteristics	M 4887 (66%)	F 2490 (34%)	Total 7377
Total patients (%) with				
- Myocardial infarction		2974 (61%)	1079 (43%)	4053 (55%)
- Angina pectoris		2683 (55%)	1496 (60%)	4179 (57%)
- Cerebral vascular accident		445 (9%)	386 (16%)	831 (11%)
- Peripheral vascular disease		364 (7%)	212 (9%)	576 (8%)
- Diabetes mellitus		829 (17%)	683 (27%)	1512 (20%)
- Hypertension		1517 (31%)	1172 (47%)	2689 (36%)
- Smoking		2141 (44%)	799 (32%)	2940 (40%)
- Positive familial history*		1726 (35%)	885 (38%)	2611 (35%)
- Familial hypercholesterolaemia		302 (6%)	185 (7%)	487 (7%)
Age in years (SD; range)		58 (9; 22-80)	63 (10; 24-82)	60 (10; 22-82)
Body mass index in kg/m ² (SD; range)		27.2 (3.8; 17.8-68.7)	27.9 (5.2; 16.4-68.4)	27.4 (4.4; 16.4-68.7)
Initial total cholesterol in mmol/l (SD; range)		6.7 (1.3; 3.5-20.9)	7.0 (1.5; 2.9-29.0)	6.8 (1.4; 2.9-29)
Initial total HDL in mmol/l (SD; range)		1.1 (0.4; 0.5-3.5)	1.3 (0.4; 0.4-3.3)	1.1 (0.4; 0.4-3.5)
Initial total LDL in mmol/l (SD; range)		4.5 (1.3; 1.9-15.5)	4.6 (1.3; 1.9-10.5)	4.5 (1.3; 1.9-15.5)
Initial triglycerides in mmol/l (SD; range)		2.7 (2.0; 1.1-30.9)	2.3 (2.0; 1.2-39.4)	2.5 (2.0; 1.1-39.4)

*First-grade relative with coronary heart disease before the age of 60.

A more distant objective of the study is to determine whether changes in the practice of secondary prevention occur during follow-up. We carefully examined the medical records of a large group of patients with known elevated cholesterol levels who were treated by cardiologists and internists in the Netherlands.

Methods

The Dutch CBO guidelines recommend treating all patients with documented cardiovascular disease and a cholesterol level higher than 5.0 mmol/l. Although the Dutch CBO guidelines have not set a specific therapeutic cholesterol goal as there is no proof yet that lower cholesterol is really better, the unofficial target values of 5-3-2-1 are very well accepted in the Netherlands.

A cross-sectional study of 22 cardiology and 19 internal medicine practices was conducted in the Netherlands during the period 2000 to 2001. To sample adequate numbers of patients in relevant subgroups,

the study was set up to include at least 8000 patients. Consequently, from each of the 41 participating practices the intention was to include 200 patient records.

Seventy-one internist and cardiology practices in the Netherlands were invited to take part in the study. Of these, 57% were prepared to participate. A study nurse surveyed 22 cardiology and 19 internist practices. For the period September 2000 to August 2001, 200 patient records per practice were selected from the total patient database.

Patients with documented coronary heart disease (CHD), an initial untreated total cholesterol >5.0 mmol/l, age <70 years or with a life expectancy of at least five years and with a specialist consultation no more than 14 months ago were eligible for inclusion in the study.

The study included data from a total of 7377 patients (4887 male and 2490 female). All data were processed anonymously by assigning a code to each case record and by blinding all of the identifying data. Only the specialist knew the key to the code.

The following data were extracted from patient records using a standard protocol: sex, age, body mass index, cardiovascular history such as myocardial infarction, cerebral vascular accident or peripheral vascular disease, the presence of the risk factors diabetes mellitus, hypertension, smoking, a positive familial history such as first-grade relative with a myocardial infarction or cerebrovascular accident, angina pectoris or peripheral vascular disease (genetically established familial hyper-

Table 2. Most recent lipid profile in mmol/l (SD).

	Males	Females	Total
Total cholesterol	5.1 (1.0)	5.3 (1.0)	5.1 (1.0)
Total HDL	1.2 (0.4)	1.3 (0.4)	1.2 (0.4)
Total LDL	2.9 (1.0)	3.0 (1.1)	3.0 (1.1)
Triglycerides	2.0 (1.5)	1.9 (1.1)	2.0 (1.4)

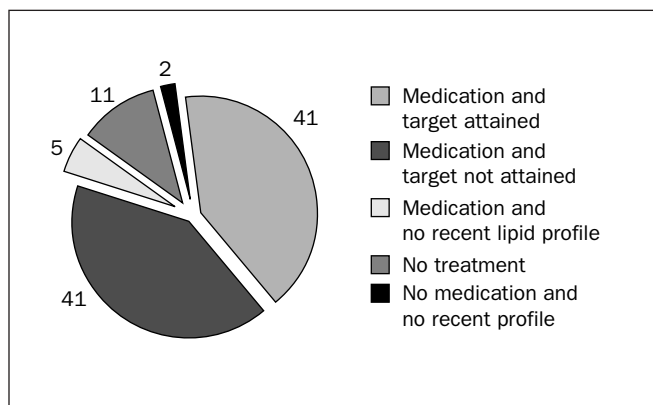


Figure 1. Treatment status and cholesterol levels in comparison with current Dutch national guidelines.

cholesterolaemia or an annotation by the specialist indicating that this disease was present in the patient's family before the age of 60), familial hypercholesterolaemia, the earliest known lipid profile (total cholesterol, LDL cholesterol, HDL cholesterol, and triglycerides) and the most recent lipid profile. In 0.8% of the cases, data for the most recent total cholesterol levels were missing.

This report presents the baseline data of patients who, according to the guidelines, are eligible for treatment.

Results

The general characteristics of the patients are presented in table 1.

Table 2 shows the most recent lipid profiles of the study population. On average, the initial cholesterol levels as well as the most recent total cholesterol levels were higher in male patients than in female patients: 5.1 mmol/l (1.0) versus 5.3 mmol/l (1.0). The case records of 6450 (87%, 95% confidence interval 86.7-88.2) patients showed that they were receiving treatment, 813 patients (11.0%, 10.3-11.8) were not receiving treatment despite a pertinent indication (figure 1) and 114 patients (1.5%, 1.3-1.9) were not receiving medication and had no recent lipid profiles but had previously had elevated cholesterol levels.

A total of 3001 patients (40.7%, 39.6-41.8) had a total cholesterol lower than 5.0 mmol/l, in agreement with the treatment goal. For 3085 patients (41.8%, 40.7-43.0), the target cholesterol level had not (yet) been attained, and for 364 patients (5.6%, 5.0-6.2) no recent lipid profile was available despite a recent visit (not longer than 14 months ago) to the specialist. Of the 3085 treated patients with a serum cholesterol above the target, 1511 patients (49.0%, 47.2-50.7) had a total cholesterol between 5.0 and 5.5 mmol/l (figure 2).

The average total cholesterol of patients with familial hypercholesterolaemia and a documented history of cardiovascular disease was 5.3 mmol/l (1.1): males 5.2 mmol/l (1.1) versus females 5.5 mmol/l (1.2).

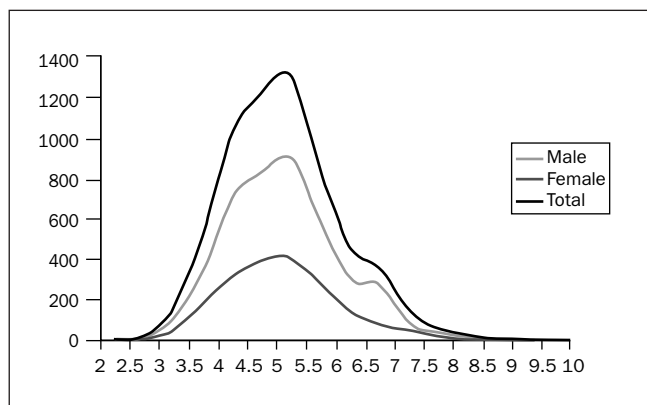


Figure 2. Distribution of total cholesterol levels for 6450 patients currently treated with medication.

Patients with diabetes mellitus and a history of cardiovascular disease accounted for 20% (1512 patients) of the total population. The average total cholesterol of this group was 5.0 mmol/l (1.0): males 4.9 mmol/l (1.0) and females 5.1 mmol/l (1.0).

Discussion

Findings from the SOLID study demonstrate that of the patients being treated by Dutch internists and cardiologists who have a documented history of cardiovascular disease and who are eligible for cholesterol-lowering treatment according to the most recent Dutch guidelines, 87% are currently on drug treatment. Of this group 47% have serum cholesterol levels at or below target levels.

Certain issues need to be addressed before these findings can be appraised. The strength of this study is the number of patient records included. In addition, this vast amount of information was provided by a large number of specialists, and is thus a good view of the treatment provided by the average specialist. However, as a fair proportion of those specialists invited for the study declined to participate, some selection is likely to have occurred. Therefore some positive bias in the results is likely. Note that this will also positively bias the degree of control of lipid levels in the patients included in the study. A limitation of the study is that the data were obtained retrospectively. An effort was made to avoid selection bias by systematically and consecutively evaluating the case records on their usability, for example to determine whether or not the patient was eligible for treatment according to the Dutch guidelines. A patient was eligible for inclusion in SOLID if no more than 14 months had elapsed since the last time the patient visited the specialist for cholesterol-lowering therapy. A 14-month period was chosen because according to the Dutch guidelines patients have to consult their specialist for a cholesterol check-up once a year. In 14 months the majority of the patients have their cholesterol checked.

In recent years a number of similar studies have been carried out that can be compared with SOLID. The LIPID Treatment Assessment Project (L-TAP)⁷ took place in five regions of the United States, in the areas of cardiology, endocrinology and general practice from August 1996 until 1997. It included 1466 patients with documented cardiovascular disease who were eligible for cholesterol-lowering therapy. Only 18% of these patients were adequately treated.

A previous Dutch study, PROTECT⁸ (from May 1996 until the end of 1997), found that 30% (1214 out of 4041 patients with documented CHD) of patients received optimal treatment. For the PROTECT study a target level of 5.0 mmol/l was used. However, the data were presented according to cholesterol levels <5.5 mmol/l versus >5.5 mmol/l, to indicate how many patients were clearly undertreated with respect to the guidelines.

A SMART study report,⁹ covering the period from September 1996 to 15 November 1998, included patients who visited a university hospital clinic with a first-time manifestation of vascular disease and who were also eligible for cholesterol-lowering therapy. Of the patients with hyperlipidaemia, 45% did not receive treatment, despite a pertinent indication. Of the patients who were treated, only 9% had a cholesterol level at or below the target level.

The individual results of the SOLID study have been discussed with the participating internists and cardiologists. In the prospective phase of SOLID, the extent to which this information leads to an adjustment in the treatment of individual patients will be examined, by using the same study procedures after a period of ten months. The same patients will be checked, if needs be in a general practice.

During the individual feedback talks about the results from the survey, enquiries were made as to why the target cholesterol level was not attained with a significant number of the patients. The specialists responded that this was due to a lack of compliance, knowledge and insight on the part of the patients, as well as an unwillingness to change their lifestyle. In addition, the specialists stated that they did not have enough time per patient to provide optimal advice and motivation. Olson et al. recently reported a literature study suggesting numerous physician-related factors that may affect the effectiveness of the management of patients

with hypercholesterolaemia.¹⁰ One main factor was a lack of knowledge about guidelines.

In conclusion, the results of the SOLID study reveal that in comparison with previous studies, a relatively large percentage of patients with a history of cardiovascular disease and an indication for cholesterol-lowering therapy under the care of Dutch internists and cardiologists are currently being treated in accordance with prevailing guidelines. A fair proportion of patients, however, are not receiving optimal treatment and 11% are not treated at all. ■

Acknowledgement

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References

- 1 Murray CJ, Lopez AD. Mortality by cause for eight regions in the world: Global Burden of Disease Study. *Lancet* 1997;**346**:1436-42.
- 2 Martin MJ, Hulley SB, Browner WS, et al. Serum cholesterol, blood pressure and mortality: implications from a cohort of 361,662 men. *Lancet* 1986;**152**:933-6.
- 3 Shepherd J, Cobbe SM, Ford I, Isles CG, Lorimer AR, MacFarlane PW, et al. Prevention of coronary heart disease with pravastatin in men with hypercholesterolemia. *N Engl J Med* 1995;**333**:1301-7.
- 4 EUROASPIRE Study Group. EUROASPIRE. A European Society of Cardiology survey of secondary prevention of coronary heart disease: principal results. European Action on Secondary Prevention through Intervention to Reduce Events. *Eur Heart J* 1997;**18**:1569-82.
- 5 Scandinavian Simvastatin Survival Study Group. Randomised trial of cholesterol lowering in 4444 patients with coronary heart disease. *Lancet* 1994;**344**:1383-9.
- 6 Centraal Beleidsorgaan voor de Intercollegiale Toetsing (CBO) Consensus cholesterol. Behandeling en preventie van coronaire hartziekten door verlaging van de plasmacholesterolconcentratie. Utrecht: CBO, 1998.
- 7 Pearson TA, Laurora I, Chu H, Kafonek S. The Lipid Treatment Assessment Project (L-TAP). A multicenter survey to evaluate the percentages of dyslipidemic patients receiving lipid-lowering therapy and achieving low-density lipoprotein cholesterol goals. *Arch Intern Med* 2000;**160**:459-67.
- 8 Vermeer F, Haest R, Wild JSL van der. Cholesterolverlaging in het kader van secundaire preventie; het verschil tussen de praktijk en de herziene cholesterolconsensus: Het Protect-project. *Cardiologie* 1999;**12**:609-14.
- 9 Laak MF van de, Graaf Y van der, Banga JD, Simons PCG, Algra A. Prevalence and treatment of hypercholesterolaemia in patients with manifest vascular disease according to the criteria of the current cholesterol consensus. *Ned Tijdschr Geneesk* 2000;**144**:706-9.
- 10 Olson KL, Bungard TJ, Tsuyuki RT. Cholesterol Risk Management: A systematic examination of the gap from evidence to practice. *Pharmacotherapy* 2001;**21**:807-17.