

Cost-effectiveness of Cholesterol-lowering Therapies

Prosser LA, Stinnett AA, Goldman PA, Williams LW, Hunink MG, Goldman L, Weinstein MC. Cost-effectiveness of cholesterol-lowering therapies according to selected patient characteristics. *Ann Intern Med* 2000;132:769–79.

Study Overview

Objective. To assess how the cost-effectiveness of primary and secondary prevention with cholesterol-lowering therapies varies according to patient risk factors.

Design. Cost-effectiveness analysis using published data.

Setting and participants. Hypothetical male and female patients aged 35 to 84 years with low-density lipoprotein (LDL) cholesterol levels of ≥ 160 mg/dL.

Methods. Patients were divided into 240 subgroups based on age, sex, and risk factors for coronary artery disease including smoking, blood pressure, LDL cholesterol levels, and high-density lipoprotein (HDL) cholesterol levels. The treatment approaches evaluated were step I diet, statin therapy (pravastatin), and no intervention. The patients were followed for 30 years.

Main outcome measures. Incremental cost-effectiveness ratios (ie, the difference in time-discounted costs between the evaluated strategy and the comparison strategy divided by the difference in time-discounted quality-adjusted life-years [QALYs]).

Main results. The cost-effectiveness of primary prevention with step I diet compared with no intervention ranged from \$1900/QALY to \$500,000/QALY depending on subgroup characteristics. The cost-effectiveness of primary prevention with a statin compared with step I diet ranged from \$54,000/QALY to \$1,400,000/QALY. Secondary prevention with a statin cost less than \$50,000/QALY for all risk subgroups. Sensitivity analysis showed that the inclusion of niacin as a primary prevention option resulted in much less favorable incremental cost-effectiveness ratios for primary prevention with a statin ($> \$500,000/\text{QALY}$). Sensitivity analysis also showed that a 50% reduction in drug costs would reduce the cost-effectiveness ratios by 50% to 60%.

Conclusion

Statin therapy was cost-effective for secondary prevention and cost saving in high-risk subgroups; it was not cost-effective for primary prevention for young men and women with few risk

factors. Step I diet was cost-effective for primary prevention in groups with several risk factors but not in young women.

Commentary

A number of studies have shown that statins are effective in reducing morbidity and mortality among patients who have had coronary events [1,2] and in reducing events in patients who have not had coronary events but are at risk [3]. Several studies also suggest that statins are cost-effective when used for secondary prevention [4–6]. The findings of Prosser et al add to the evidence that the benefits of statins appear to be worth the cost when used for secondary prevention. In addition, they looked at the cost-effectiveness of primary prevention.

Although this study's measure of cost is fairly extensive, costs related to loss of work and disabilities associated with cardiovascular events were not measured. These costs could be significant and would probably have made the interventions more cost-effective had they been included. The study also did not take into account the effects of diabetes or a family history of coronary disease. Therefore, the results cannot be extrapolated to these high-risk groups that represent a substantial number of patients normally seen in practice.

The study looked only at pravastatin for primary prevention because doing so made the analysis easier to perform and because pravastatin was used in the West of Scotland study [3]. Analysis with other statins may lead to different results depending on their costs and efficacy. The finding that pravastatin remained cost-effective even when its cost was reduced by 50% is important for Europeans, Canadians, or institutions like the Department of Veteran Affairs, who may obtain the drug at lower cost.

Previous studies had more favorable results in terms of cost-effectiveness. For example, a study by Johannesson [5] based on the 4S study [2] showed a ratio of \$12,000 to \$21,000/QALY depending on risk factors. However, their analysis of the costs was not as complete as Prosser et al's.

Applications for Clinical Practice

Low-fat diet is as cost-effective as a primary prevention strategy in most patients who have risk factors but not in women younger than 55 years. Therapy with statins is cost-effective for secondary prevention and for primary prevention in persons with multiple risk factors. These findings reinforce the concept

that lipid-lowering therapy should be a high priority in secondary prevention. Further studies should be done involving patients with diabetes and a family history of coronary artery disease.

This study supports the recommendations from the American College of Physicians [7] and the National Cholesterol Education Program (NCEP) [8] that screening should be done in men 35 years of age and older and in women 45 years and older, unless other risk factors are present. Based on Prosser et al's findings, following all of the NCEP guidelines to lower cholesterol would cost approximately \$680,000/QALY. In comparison, the cost of screening for colorectal cancer with fecal occult blood testing is estimated at \$18,000/QALY, and the cost of annual mammogram in women aged 55 to 65 years is \$150,000/QALY.

References

1. Lewis SJ, Moye LA, Sacks FM, Johnstone DE, Timmis G, Mitchell J, et al. Effect of pravastatin on cardiovascular events in older patients with myocardial infarction and cholesterol levels in the average range. Results of the Cholesterol and Recurrent Events (CARE) trial. *Ann Intern Med* 1998;129:681-9.
2. Randomized trial of cholesterol lowering in 4444 patients with coronary heart disease: the Scandinavian Simvastatin Survival Study (4S). *Lancet* 1994;344:1383-9.
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. West of Scotland Coronary Prevention Study Group. *N Engl J Med* 1995;333:1301-7.
4. Pharaoh PD, Hollingworth W. Cost effectiveness of lowering cholesterol concentration with statins in patients with and without pre-existing coronary heart disease: life table method applied to health authority population. *BMJ* 1996; 312:1443-8.
5. Johannesson M, Jonsson B, Kjekshus J, Olsson AG, Pedersen TR, Wedel H. Cost effectiveness of simvastatin treatment to lower cholesterol levels in patients with coronary heart disease. Scandinavian Simvastatin Survival Study Group. *N Engl J Med* 1997;336:332-6.
6. Yusuf S, Anand S. Cost of prevention. The case of lipid lowering. *Circulation* 1996;93:1774-6.
7. American College of Physicians. Guidelines for using serum cholesterol, high-density lipoprotein cholesterol, and triglyceride levels as screening tests for preventing coronary heart disease in adults. *Ann Intern Med* 1996;124:515-17.
8. U.S. National Cholesterol Education Program. Second report of the Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel II). Bethesda (MD): National Cholesterol Education Program, National Institutes of Health, National Heart, Lung, and Blood Institute; 1993. NIH Publication No. 93-3095.

Copyright 2000 by Turner White Communications Inc., Wayne, PA. All rights reserved.