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# Pharmacoeconomic Analysis: Cost Savings Associated With Reversing Atherosclerosis as a Secondary Prevention

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## ABSTRACT

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### BACKGROUND

Cardiovascular disease (CVD), and, in particular, coronary artery disease, is the number one cause of death worldwide. Conservative studies estimate the cost of cardiovascular disease to the US health system at \$475.3 billion, of which 66% is in direct medical costs.<sup>1</sup> Atherosclerosis, the build-up of plaque within the artery wall, is the leading cause of CVD. Caused by elevated total cholesterol, low HDL cholesterol, high blood pressure and smoking, atherosclerosis leads to many downstream complications that are costly, both financially and in terms of quality of life.<sup>2</sup> The current standard of care calls for the use of statins, such as ZOCOR<sup>®</sup> and LIPITOR<sup>®</sup>, to slow the progression of further plaque build-up and reduce the probability of the complications associated with increased plaque in the arteries. Therapies currently in development, in particular apolipoproteinA1 (ApoA1) increasing therapies, have the potential to not only stop the progression, but to actually reverse plaque build-up. This analysis aims to analyze the cost savings, both quantitative and qualitative, of reversing atherosclerosis in patients with coronary artery disease. Additionally, by detailing and assigning a cost to all complications associated with CAD, a cost-benefit analysis was undertaken, comparing current standards of care with ApoA1 therapy.

### METHODS

An extensive literature search was conducted to pool data pertaining to atherosclerosis, coronary artery disease, current standards of care, and the outcome of the current standards of care. Further, a literature and public domain search was carried out to determine all costs associated with each complication associated with atherosclerosis. Relevant probabilities pertaining to each complication are outlined in Table 1. Additionally, baseline assumptions were made as part of the cost savings analysis and are detailed in this study. The total per patient cost savings were calculated by using the probabilities, and then calculating the reduction seen in ApoA1 therapy versus statin therapy for each complication.

### RESULTS

Outcomes were analyzed based on five scenarios, with ApoA1 therapy reducing plaque by 1-5% in 1% increments. The 1-5% range was based on the effect seen in the ApoA1 Milano infusion trial.<sup>19</sup> Total cost savings per patient per year for secondary prevention complications in atherosclerosis patients, as discussed in this analysis, are as follows: \$1,669 (1%), \$2,386 (2%), \$2,814 (3%), \$3,184 (4%), and \$3,555 (5%). Using these savings, daily dosing prices of \$4.57 (1%), \$6.54 (2%), \$7.71 (3%), \$8.72 (4%), and \$9.74 (5%) were determined. All estimates of cost savings are based on the impact of complications over a one-year period.

### DISCUSSION

In 2009, direct and indirect costs specifically related to coronary heart disease in the US totaled \$165.4 billion.<sup>1</sup> Despite the introduction and use of statins, which have revolutionized cholesterol management by lowering LDL, the health burden and cost of coronary heart disease remains high. Statins are restricted in their disease-modifying capacity with respect to regression of atherosclerosis, unlike ApoA1 therapies which have been shown to reverse atherosclerosis. Because increasing ApoA1 has been shown to reduce percent atheroma volume and is predicted to positively impact the mortality and morbidity of CVD and stroke patients, the impact on other outcomes, such as myocardial infarction (MI), strokes, revascularizations, and unstable angina hospitalizations, will also be positive. There are an estimated 450,000 and 150,000 deaths from heart disease and stroke annually, and over 2 million non-fatal MIs and strokes annually. By using an ApoA1-increasing therapy in all patients as a secondary prevention measure, outcomes could be significantly improved and the potential savings to the US health care system, society, and employers are between \$22.9 billion and \$76.8 billion annually, for 1% and 5% regression of atherosclerosis, versus the current standards of care. These savings assume the healthcare system pays \$1,000 or saves \$669 per patient and \$2,555 per patient annually for ApoA1 therapy for 1% and 5% regression, respectively. To further assess the effectiveness of ApoA1 therapy as a healthcare intervention, we determined the number needed to treat (NNT) for all outcomes. All NNTs were computed using atorvastatin as the benchmark, and we observed that the greater the % regression of atherosclerosis, the lower the overall NNT. When increasing regression beyond 1%, clear

effectiveness of ApoA1 therapy as a healthcare intervention is seen. As an example, at a 4% regression level, the 4-year NNT for ApoA1 therapy was 17, comparing favorably to the estimated atorvastatin 4-year NNT of 65. Other less tangible cost savings related to atherosclerosis regression, such as improved organ function, including cognitive function, is too speculative to enter into these models, but would be a natural additional effect following a successful treatment effect. Throughout this analysis, it was assumed that ApoA1 therapy would be used in combination with statins and that all cost savings generated were mutually exclusive of the cost savings generated by statins and, in particular, atorvastatin. We believe that statins will likely remain the standard of care; however, if ApoA1 therapy can regress atherosclerosis closer to 5% annually, a strong argument can be made to replace the standard of care with ApoA1 therapy.

## **CONCLUSIONS**

Our results suggest a strong economic case for the use of ApoA1 therapies in the treatment of atherosclerosis through the total annual healthcare savings in the US, and the total savings per patient per year. Additionally, low NNT numbers for outcomes analyzed within this document further support a strong case for the use of ApoA1 therapies and its reimbursement by various payer groups. It is possible that over a 10-year period, ApoA1 therapy could potentially save the US healthcare system between \$229 billion and \$768 billion. Until outcomes data is available from clinical studies of ApoA1 therapies, determining the exact impact on outcomes, and savings to the healthcare system remains an exploratory exercise.

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