Cost-Effectiveness Analysis

Project Objective

The objective of this project was to calculate the expected effect on health and economic outcomes of a proposed new program for managing people with diabetes and coronary artery disease (CAD) in Kaiser Permanente, called "A-L-L". These estimates were needed to give administrators sufficient confidence to implement and aggressively promote the program.

Introduction

In 2002 some physicians at Kaiser Permanente came up with an idea: What if KP members with diabetes or CAD were systematically given a bundle of drugs consisting of aspirin, lovastatin (a cholesterol drug) and lisinopril (a blood pressure drug) – called "A-L-L"? Their clinical intuition told them that it should have an important effect on complications, but there was no direct evidence of that and no way to determine the magnitude of the effects on either clinical outcomes or costs. They knew they needed this type of information if they were to convince their colleagues and KP's administrators to adopt the program, or even conduct a trial to test it. They decided to use the Archimedes Model to predict the expected outcomes.

Project Approach

To analyze this problem we created a simulated population that represented the people over age 55 with diabetes or CAD in Kaiser Permanente's northern and southern California regions. We also used information on Kaiser Permanente's costs for drugs, lab tests, office visits, and admissions for heart attacks and strokes. We then created two scenarios to represent alternative management strategies for patients with diabetes. In one scenario, called "current care", patients with diabetes continued to receive the type of care they had been receiving in the past, based on national guidelines with realistic levels of performance and compliance. In the other scenario, called "A-L-L program", patients with diabetes were given the A-L-L program in addition to current care. We then used the Archimedes Model to forecast the health, logistic, and economic outcomes for both scenarios over a 30 year period, with measurements at annual intervals.

Annual risk of events around year 5
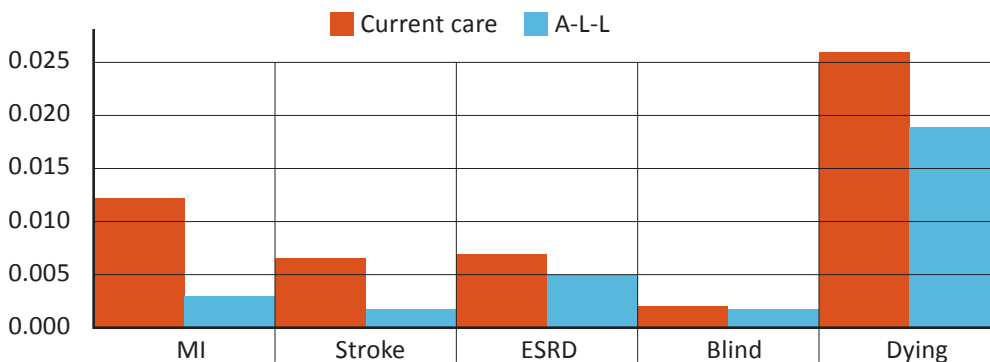
> "Archimedes was a decisive factor in changing our care from a simple initiative without significant savings, into a program that now saves lives, heart attacks and strokes and has more than paid for itself."
>
> **R James Dudl, MD,**
> **Clinical Diabetes Lead,**
> **Care Management Institute,**
> **Kaiser Permanente**

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Numbers

- **15 per 1,000:** reduction in admissions for MI and strokes per year in those receiving the A-L-L program at just a low intensity

- **26 per 1,000:** reduction in admissions for MI and strokes per year in those receiving the program at high intensity

- **1,271 heart attacks and strokes:** prevented each year in the study population

- **8,000 heart attacks and strokes:** prevented each year if fully implemented throughout Kaiser Permanente

- **$38 million:** Estimated reduction of healthcare utilization costs per year just in the study population

- **$120 million:** Estimated reduction of healthcare utilization costs per year if fully implemented

- **17,000 MIs and strokes:** prevented each year in the US if just 20% of diabetics in the US over age 65 followed low exposure to A-L-L

- **32,000 MIs and strokes:** prevented each year in the US if an additional 10% of diabetics followed high exposure to A-L-L

- **$1 billion:** Estimated reduction of healthcare utilization costs each year in the US if 10% of diabetics followed high exposure to A-L-L

Results

The Archimedes Model predicted that, when added to current care, Kaiser Permanente's A-L-L program would reduce heart attacks and strokes approximately 71% and would reduce diabetes-related costs approximately $500 per person per year. The Model also predicted that the effect on health outcomes would begin almost immediately, within the first two years. The effect on costs were estimated to be slower in developing, with savings of approximately $350 in the initial years, but gradually increasing to more than $700 per person per year. The Model predicted that the A-L-L program would simultaneously improve the health of Kaiser Permanente's members while also saving an estimated $38 million annually in unnecessary healthcare costs.

Business Applications

Given the outcomes from the Archimedes Model were so promising, Kaiser Permanente decided to launch and heavily promote a program-wide effort to provide the A-L-L program to all patients with diabetes. The program was begun in 2004.

Evaluation

In 2007, the Care Management Institute (CMI) at Kaiser Permanente conducted an independent evaluation to determine the extent to which the A-L-L program was being used, and the program's actual effects on the incidence of cardiovascular disease. During 2004 and 2005, approximately 28 percent of people with diabetes with or without CAD were receiving the A-L-L program at a low intensity (receiving approximately less than half the intended compliance rate) and 13% were receiving the program at a high intensity (more than half the intended compliance rate).

Using an instrumental variable analysis of facility level use rates, CMI estimated that by the third year of implementation, in 2006, admissions for heart attacks and strokes were decreased by 60% in people receiving low intensity of the A-L-L program, and were virtually eliminated in people receiving the A-L-L program at high intensity. Even with incomplete compliance during the first two years, CMI estimated that in the year 2006, "Among members with low exposure to A-L-L in 2004 and 2005, the hospitalization rate for MI and stroke in following years decreased by 15 per 1000 members, compared to members with no exposure… Among members with high exposure to A-L-L over two years, the rate of adverse events in the following year decreased by 26 per 1000 members….[These] results are consistent with those modeled by Archimedes: i.e., compared to no exposure, 60% reduction in the low exposure group (95% CI, 1%-96%)."

In absolute terms, CMI estimated that A-L-L prevented 1,271 hospitalizations for heart attacks and strokes in 2006, in the study population of 170,024 members. They estimated that if projected to the entire Kaiser Permanente diabetes population, more than 8,000 hospitalizations for heart attacks and strokes would be prevented each year. Using the results and projecting costs and savings, the Archimedes Model estimated a net savings (after paying for the costs of drugs) of approximately $38 million a year, or approximately $350 per person. On the basis of this, Kaiser Permanente has decided to intensify its efforts to deliver the A-L-L program to the remainder of its diabetic population.

References

- Dudl JR, Wang MC, Wong, M, Bellows, J. *Preventing Myocardial Infarction and Stroke with a Simplified Bundle of Cardioprotective Medications.* The American Journal of Managed Care, 2009 Oct 1;15(10):e88-94.

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