ARCHIMEDES
Quantifying Healthcare

Policy Impact Analysis

Project Objective

To identify which single or combined health care prevention activities, when implemented throughout adulthood, will lead to improvements in health, quality of life, and medical costs for patients who enter Medicare during the years spanning 2009-2033.

Introduction

What would the health, quality of life, and costs be to your insured population if throughout their lives they received screening, monitoring, and medical care precisely according to nationally recommended clinical practice guidelines? Would these individuals' long-term outcomes be any better or worse than those based on current care? Would early intervention be more or less costly than treating late disease? What single interventions such as medication for high blood pressure, annual screening appointments for diabetes, aspirin for heart disease, or others have the biggest impact on quality of life 30 years down the road, and which ones, perhaps do not matter at all? Or is the value of all interventions taken together greater than the sum of their parts?

As Americans age, disease burden in the Medicare population is anticipated to double. The U.S. is on track towards a Medicare train wreck, where patients will suffer more ill health because we achieve less preventive health care than national clinical practice guidelines recommend. What if we change tracks, and implement much better adherence to single or combined prevention guidelines? Will this track lead to a healthier Medicare population, and if so, at what cost?

Project Approach/Methodology

Archimedes identified and modeled the effects of single interventions such as weight control, blood pressure maintenance, cholesterol screening, and others, and compared the long-term outcomes of patients receiving these interventions to those receiving enhanced yet feasible levels of care, and to those receiving 100% of all of the recommended interventions. By predicting which single or combined intervention(s) are most impactful to long-term outcomes, evidence-based goals for physician and patient performance and compliance can be identified that will lead to a substantially healthier and less costly patient population.

Archimedes created a simulated population matching the real population that will enter Medicare between 2009 and 2033, and modeled over a 30-year pre-Medicare eligibility time span, the effect of single cardiovascular and diabetes intervention activities as well as the full repertoire of the current recommended activities on health outcomes, quality of life, and direct medical costs. These simulations were performed at both 100% compliance to recommended guidelines – a recognized unfeasible level - and to an aggressive but attainable level of physician and patient performance. They were then compared to current levels of practice. Output of the Model included an "annual report" each year from 2009-2033 of morbidity, mortality, cost of care, and quality of life associated with each intervention.

> *"Using Archimedes the Preventive Health Partnership was able to significantly deepen their understanding of the role and importance of prevention.*
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> *Simulated trials offer powerful support to advocacy, policy-making, and healthcare and health economic decision makers."*
>
> **Alan J. Balch, Ph.D.**
> **Vice President,**
> **Preventive Health Partnership**
> **(A collaboration between the ADA, ACS, & AHA)**

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Outcomes/Conclusions

The Archimedes Model predicts and differentiates between interventions in terms of health outcomes, costs, and quality of life by the time individuals reach the age of Medicare eligibility. Many compelling conclusions were predicted, suggesting significantly lower disease burden, but in some cases at higher cost. Several notable predictions include:

- If clinical practice were to achieve the ideal of 100% of the recommended preventive guidelines for all interventions, myocardial infarctions (MI) and strokes would be reduced by 68% and 30% respectively in the Medicare population. Coronary heart disease related deaths would be reduced by 59%, and 5.2 million more people would be alive each year.
- At 100% clinical practice performance, the most important single interventions for preventing MI were, in descending order: achieving HDL cholesterol targets, body mass index (BMI) control, LDL cholesterol control, aspirin use, and blood pressure control.
- At 100% performance with all interventions being implemented, total medical costs would double. However, the most cost savings single interventions were predicted to be beta-blocker use after MI, aspirin for high-risk individuals, smoking cessation, and BMI control to < 30.
- At more realistic levels of clinical performance, mortality due to MI and stroke would be reduced by 33% and 19% respectively.
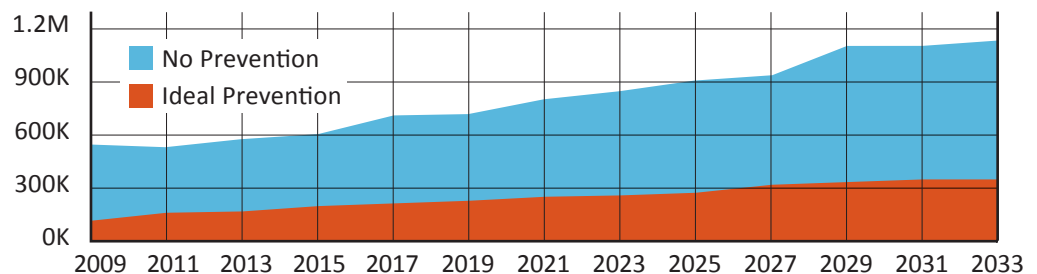
There are several tracks that Medicare can take as Americans age: 1) Follow the current practice strategy of medical prevention that will lead to a doubling of disease burden in our elderly population by 2033, 2) Follow an improved prevention strategy that while significantly reducing disease burden, may lead to increased costs, or 3) Implement the best of both aforementioned tracks by focusing on those interventions that lead simultaneously to better health outcomes and reductions in cost.

Archimedes helps predict intervention strategies to improve health, cost, and quality of life for populations that matter to your business.

Business Improvements

- Clinical trials of 30 years duration are prohibitively expensive, and ones that involve 30 million patients are not feasible. The Archimedes Model offers a way to study outcomes that would otherwise be prohibitively expensive, time consuming, or simply impossible to perform in the real world.
- Removing patients from all standard-of-care interventions to study the effects of just the intervention of interest would be unethical. Simulating such interventions in the Archimedes Model, on the other hand, is a means of focusing exclusively on one or more interventions of interest.
- Simulated trials of this sort offer powerful support to advocacy, policy-making, and health-care and health economic decisions.

Number of MIs with no prevention versus ideal prevention