IN SEARCH FOR THE MOST COST-EFFECTIVE STRATEGY: A CORONARY HEART DISEASE POLICY ANALYSIS

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ABSTRACT

Heart disease is the leading cause of death, disability and medical spending in the United States. Technological advances have significantly improved the health outcomes of patients with coronary heart disease (CHD) but have also increased costs. However, misaligned incentives have resulted in widespread underuse of low cost, high benefit therapies (e.g. beta blockers and statins) and overuse of high cost, low benefit therapies (e.g. elective percutaneous coronary interventions). We use agent-based modeling (ABM) to explore the health and economic impact of changing the financial incentives (out-of-pocket costs) faced by Medicare patients with CHD. Using NetLogo, the patient's life course is simulated to determine the likelihood of heart attacks and death. Financial incentives impact the use of key therapies, which impact the likelihood of events. The model will enable policy makers to identify the most cost-effective incentive policies—i.e., to maximize the health improvements obtained for the money spent.

1 INTRODUCTION

Coronary heart disease costs the U.S. $108.9 billion each year (Heindenreich 2011). As the population ages and patients with CHD live longer, the health and economic burden of the disease continues to grow. Our scientific understanding of which healthcare interventions provide good or poor value (i.e. maximize quality-adjusted life years for the dollar spent) has grown as well. Yet, the incentives faced by patients and providers are not aligned to maximize value. For example, many patients with CHD are not taking clinically proven effective drugs, such as beta blockers, statins, and ACE inhibitors (ACE) due to high out-of-pocket costs. On the other hand, the incentives for providers are to perform percutaneous coronary interventions (PCI) regardless of whether they provide high value—as in the setting of a heart attack—or low value—as when they are performed electively (where the benefits are debatable) (Boden 2008). This study uses ABM to evaluate the incremental costs and quality-adjusted life expectancy of different policies which vary patient out-of-pocket costs and provider reimbursements for these drugs and procedures.

2 METHODOLOGY

The medical decision making literature frequently uses Markov models to address such problems. For example, Choudhry's 2008 paper uses a Markov model to study the cost-effectiveness of a different Medicare payment policy for patients with CHD after a heart attack. Agent Based Modeling, while ideally suited to model behavior change in multiple agents, such as patients and physicians, has not been well utilized in the medical decision making literature. This paper uses ABM to model behavior change in

both patients and physicians in response to targeted incentives to improve use of the most valuable therapies and reduce use of the least valuable therapies for CHD, as well as to understand the impact of these behaviors on the system.

Figure 1 depicts the order in which patients can have events. Time passes in discrete steps of one year. The probability of disease progression and the likelihood of using therapies is obtained from analyses of a 20% random sample of Medicare claims data and from the literature.
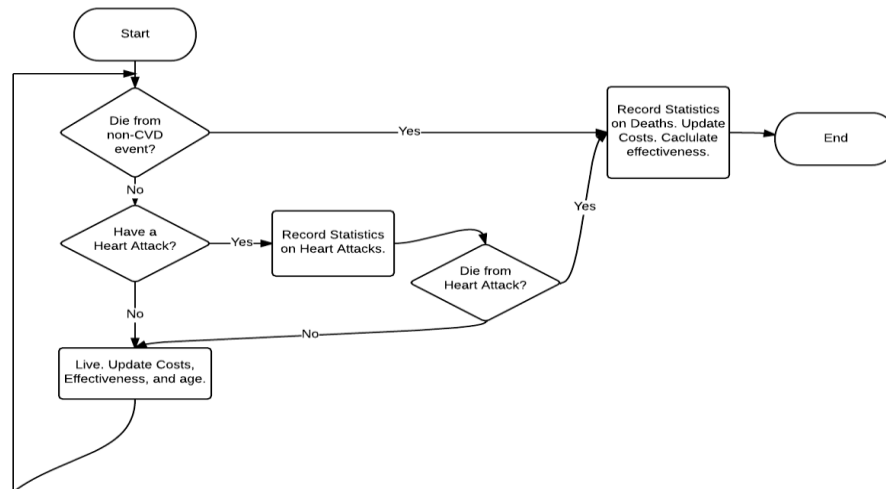

Figure 1: Flowchart of Sequence of Potential Events.

3 CONCLUDING REMARKS

Chronic disease management is a high-utilization, high-cost segment of healthcare in America. Studies of how incentives impact patient health and system cost have been limited in the medical decision making literature, and have been restricted to focusing on patient incentives only because of their reliance on Markov models. These models do not allow the simultaneous modeling of physician and patient perspectives of the problem. An agent-based model will help develop new insights in understanding how better to align both patient and provider incentives to maximize the value of spending on CHD care. The model will also demonstrate the utility of ABM methods for addressing complex health policy questions.

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