Forecasting Health Care Expenditures and Utilization based on a Markov Process and a Deterministic Cost Function in Managed Care Settings

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This study is exploratory in nature with a goal of extending the application of stochastic modeling to health economics research. The aim of this study is to investigate whether the prediction of utilization and attendant costs through the development of a stochastic model, specifically a first-order Markov chain, can be adapted to specific diseases and/or events. The original study considered three diseases. They included both chronic and acute diseases. The choices were diabetes, hypertension and myocardial infarction. For the purposes of this article the application is illustrated by looking at the group with hypertension. The group of $n = 1019$ was randomly split into two groups. They were then categorized into age groups {over 66/under 66} and gender {male/female}. The first group was used to generate the transition probabilities and second was used to validate the results. Chi-square analysis was performed and there were no significant differences between the groups. The costs were computed and presented.

1. Introduction. Predicting cost in the health care environment is a challenging dilemma for medical professionals. The importance of a viable cost model incorporating outcomes measurement and payment schemes is of interest [16, 10, 17]. Healthcare administrators want to assure that the delivery of services is appropriate as identified by federal government guidelines, rules and regulations [22]. A critical starting point is to provide the framework necessary to provide a cost model that considers the general factors of healthcare encounters, patient diagnosis, treatment and the related costs that can be used to describe this complex problem. The very stochastic nature of disease treatment can lead to substantial variation in experience between and among classes of enrollees, their diseases, and treatment utilization patterns [20]. The most common approach to analyzing "cost of disease" is the "traditional method" of summing the number of events occurring in the system over a period of time and calculating the mean and a standard deviation of cost [9]. There is a need for more sophisticated models to predict cost in the health care environment. A wide variety of conceptual and statistical models exist, both deterministic and stochastic, to measure utilization in health research [9]. The deterministic models are "traditional model" (summing of events), and decision analysis (decision tree). The limitation of the "traditional model" is its inability to account for the skewness of cost data. Decision trees can be effective models in economic and policy analyses, because they can provide information to patients and practitioners about risk and cost. The difficulties with this model arise when timing becomes a