CONCLUSIONS: In the two path analytic models evaluated, only patient compliance had a significant direct effect on PCS. Re-specification of the models is needed.

DECISION ANALYTIC MODELING

ASSESSING THE PREDICTIVE ABILITY OF A DETERMINISTIC MODEL AND STOCHASTIC MODEL

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Formulary decisions are often based upon the safety, efficacy, and projected costs of medications. Models used to predict costs are rarely assessed to determine their predictive ability.

OBJECTIVE: The purpose of this study was to assess the ability of a decision analytic deterministic model and a regression analytic stochastic model to predict the diabetes-specific costs incurred during the 12 months after metformin was added to an HMO formulary. The ability of the stochastic model to predict total healthcare costs was also assessed.

METHODS: The deterministic model, a decision tree, was constructed within an equilibrium framework using literature-based probabilities and internal costs to predict diabetes-specific costs. A regression model was constructed using medical and pharmacy claims data to predict diabetes-specific cost and total healthcare costs.

RESULTS: The total diabetes-specific cost estimate predicted by the decision analytic model came within 5% of actual costs. The model underestimated the diabetes-specific medical costs and overestimated the diabetes-specific pharmacy costs. The diabetes-specific regression model produced an estimate that was within 18% of the actual costs. The total healthcare cost model estimate was within 7% of the actual costs. The total and diabetes-related medical cost estimates were within 6% and 46% of the actual costs respectively. The total and diabetes-specific pharmacy costs were within 20% and 49% of the actual costs, respectively.

CONCLUSION: Further research is needed to refine model construction techniques. A decision tree constructed with internal data should be used to predict disease-specific costs when only medical and pharmacy claims data from the previous year are available, and a regression model should be used to predict total healthcare costs.

COST-EFFECTIVENESS OF INCREASING WARFARIN USAGE FOR STROKE PROPHYLAXIS IN PATIENTS WITH ATRIAL FIBRILLATION

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In response to mounting pressures to improve stroke prophylaxis for patients with atrial fibrillation, many hospitals and healthcare systems have opened specialty anticoagulation clinics.

OBJECTIVE: The purpose of this study was to determine the cost-effectiveness of stroke prophylaxis from a hospital system perspective.

METHODS: We have developed a decision model representing several options for stroke prophylaxis. Simulated patients could receive warfarin through either an anticoagulation clinic or their family physician, aspirin, or no therapy. Possible events were thromboembolic stroke, hemorrhagic stroke, hemorrhage requiring hospitalization (major hemorrhage), or hemorrhage requiring a clinic visit and/or warfarin dose adjustment (minor hemorrhage). Three different scenarios of stroke prophylaxis are presented: 1) a healthcare system with an anticoagulation clinic; 2) a system which maximizes anticoagulation with warfarin via the family physician; and 3) a system which maximizes anticoagulation but utilizes anticoagulation clinics to a larger extent.

RESULTS: Option 1 was the least costly and effective strategy with a 10-year average cost of $6327/patient treated and a life expectancy of 7.728 years. The values for 2 and 3 were $6549 and 7.735 life-years, and $6443 and 7.761 life-years, respectively. The incremental cost-effectiveness was $34,339/life-year saved for 2 versus 1 and $4013/life-year saved for option 3 versus 1. Option 3 was dominant over 2. These results were sensitive to the cost per clinic or office visit and the rate of occurrence of major hemorrhage.

CONCLUSION: Increasing warfarin utilization is cost-effective from a healthcare system’s perspective. Anticoagulation clinics appear to be the best method for achieving this goal.

IS THERE POTENTIAL BIAS IN MODELING WITH DECISION ANALYTIC SOFTWARE OR MATRIX PROGRAMMING?

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Decision analytic software is commonly used to estimate long-term costs or effects of treatment by using Markov models. Monte Carlo simulation is used to estimate confidence limits (CL) for costs or effects in decision models. Exact cost or effects may be calculated by matrix inversion. CL for costs and effects may be calculated from matrix inversion by using distributions for each transition probability.

OBJECTIVES: The objective of this study was to validate decision analytic software by comparing the bias in decision analytic CL and matrix CL.