IMPACT OF AGE, GENDER, AND OUT-OF-POCKET COSTS ON THE TIME TO DISCONTINUATION OF ORAL ANTI-DIABETIC AGENTS AMONG PATIENTS WITH TYPE 2 DIABETES
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OBJECTIVE: This study investigated the effect of age, gender, and out-of-pocket expenditures on medication use and the time to discontinuation among patients with Type 2 diabetes (T2D).

METHODS: Patients’ pharmacy and medical data were obtained from a proprietary claims database. T2D patients, 18 years and above, on oral anti-diabetic drugs, who received benefits from managed care organizations in the year 2000 were identified. The effects of age, gender, and co-payment on the time to medication discontinuation were estimated. A medication was considered discontinued when the prescription was not refilled at the end of its day’s supply for an additional 50% of day’s supply. Co-payments within 1-week intervals were analyzed in a time-dependent Cox regression model to measure their impact on discontinuation.

RESULTS: Approximately 11,350 patients were identified with T2D. The median co-payment per prescription was $8.30. The time-dependent Cox regression model showed that the risk of medication discontinuation was 8% higher for every $5 increase in co-payment [Hazard’s ratio = 1.015]. Females had a 6% higher risk to discontinuation than males (p = .04). Patients age 62 and over have a 67% higher risk of discontinuing their medication than patients under 61 years (p < .01). CONCLUSIONS: Out-of-pocket prescription medication costs maybe a potential barrier to medication persistency. Co-payment, in addition to age and gender, significantly impacted the prescription discontinuation. Lack of routine and timely care has been documented to result in a consequent transfer of these costs for severe health episodes to payers. Policies intended to reduce patient non-compliance should be supported by managed care organizations.

A METHODOLOGY TO IDENTIFY HIGH-RISK PATIENTS WITH DIABETES IN THE CALIFORNIA MEDICAID POPULATION (MEDI-CAL)
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OBJECTIVES: The purpose of this research is to develop three econometric models [i.e., cost model (model #1); the occurrence of hospitalization or ER event model (model #2); time to hospitalization or ER event model (model #3)] that can be used to identify high-risk patients and to evaluate whether risk models are valid based on claims data from the California Medicaid (MediCal) diabetic patients.

METHODS: A retrospective study was conducted by using claims data from January 1995 to December 2000. Dependent variables were total healthcare cost, the occurrence of event, and time to event. Event included hospitalization or ER visits. Historical data including demographic factors, healthcare cost and utilization, type of drugs, increasing dose, adding drugs, and changing drugs, follow-up services based on diabetic guidelines (e.g., office visit, lab tests, and self glucose monitoring), medication compliance, complications, and comorbidity were used as independent variables. The generalized estimating equation and the fixed effect partial likelihood methods were used in a longitudinal data set and a cross-sectional data set with repeatable events, respectively. The split sample validation method was applied to validate the models.

RESULTS: The results show that if high-risk patients were identified by high healthcare costs, model #1 was the most appropriate to use since it yielded the highest percentage of correct predictions. Likewise, if high-risk patients were defined as patient who had the occurrence of hospitalization or ER event, model #2 was the most suitable to apply. Similarly, if high-risk patients were indicated by shorter time to hospitalization or ER event, model #3 was the most proper to utilize. Moreover, three models were valid.

CONCLUSIONS: The choice of method depends on how high-risk is defined by researchers or policy makers. Identification of high-risk patients with diabetes could mean healthcare providers and health plans could intervene to improve patient management.

DETERMINATION OF ASSOCIATION BETWEEN DRUG COSTS AND MEDICAL COSTS IN PATIENTS WITH TYPE 1 DIABETES
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OBJECTIVES: Proper management of type 1 diabetes with drugs may reduce medical spending affecting the overall healthcare expenditures. The objectives of this
study were 1) to determine whether there was an association between drug costs and medical costs for type 1 diabetes patients and, 2) to develop a regression model that predicts medical costs from drug costs. METHODS: The records of 315 patients enrolled in a large mid-western health care plan were reviewed for a 1-year period. The drug costs included insulin costs and oral diabetes drug costs. The medical costs included all paid services for primary and secondary diagnosis of type 1 diabetes identified by ICD-9-CM codes. The data were analyzed using SPSS 10.0. The association between drug and medical costs was determined using Pearson correlation. The significance level was set at the 95% confidence interval. Linear regression analysis was conducted to predict medical costs from drug costs. The dependent variable was the logarithm of medical costs. The independent variables were drug costs, length of service, additional therapy, age and gender. RESULTS: There was a statistically significant inverse correlation between drug costs and medical costs ($r = -0.229$, CI: $-0.33$ to $-0.13$). In the regression model the following independent variables were determined to be predictors of medical costs: drug costs ($b = 0.00$, CI: $-0.003$ to $-0.002$), additional therapy ($b = -0.362$, CI: $-0.51$ to $-0.21$) and length of service ($b = 0.002$, CI: $0.001$ to $0.002$). Age and gender were not found to be significant predictors of medical costs. CONCLUSIONS: The inverse correlation implies that if type 1 diabetes is managed appropriately with drugs, the medical costs may be reduced. This may reduce the overall health care expenditures. The regression model also showed that as drug costs increased medical costs decreased. The regression model can be used to predict the future medical costs if the drug costs are known.

**DIABETES—Economic Outcomes**

*A COMPARISON OF TWO METHODS FOR ESTIMATING HEALTH CARE COSTS OF DIABETES*

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Cost of illness estimates for chronic diseases can be underestimated if only costs related to diagnosis and treatment of that disease are measured. This underestimation results from overlooking costs associated with secondary consequences of the disease such as complications and co-morbid conditions associated with the disease. **OBJECTIVE:** Two methods for estimating medical care costs of diabetes were compared: an “attributable” method and a “case-control” method. **METHODS:** The study population was all diabetic patients in the 1999 Medical Expenditure Panel Survey, a nationally representative series of probability surveys on the use and cost of medical care in the United States. “Attributable” costs were estimated by summing costs specifically associated with diabetes. “Case-control” costs were estimated by subtracting costs between diabetic cases and non-diabetic controls which were matched on age, gender, race, and number of comorbid conditions not related to diabetes. Costs were summarized for pharmacy, hospital inpatient, outpatient, and emergency room care and reported in 1999 dollars. **RESULTS:** The total cost of illness was $3046 per patient using case-control method compared to $1151 per patient using the attributable method. The case-control method found costs to be higher for all categories of care, with the largest being hospital inpatient costs. Cost differences were statistically significant for all categories except for emergency room care. **CONCLUSIONS:** Diabetic “attributed” costs accounted for only 39% of the total difference in health care costs between diabetics and matched controls. Patients with diabetes use more medical services than controls, but a large portion of this care is not specifically attributed to diabetes.

**PDB 13**

**USING LINEAR REGRESSION TO APPROXIMATE RESULTS OF DECISION ANALYSIS: AN APPLICATION TO A COST COMPARISON ACROSS THREE FIRST-LINE DRUG STRATEGIES IN TYPE 2 DIABETES**

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**OBJECTIVES:** Few studies have compared the short-term costs to achieve recommended glycemic goals in Type-2 diabetes. We developed a decision analysis to project costs of treating patients to glycemic goals from a managed care perspective and evaluated feasibility of summarizing this model in an aggregate linear regression (LR) form. **METHODS:** A literature-based decision model simulated the 3-year treatment costs (medical, pharmacy, adverse events) to achieve an HbA1c < 7% for three cohorts of patients newly diagnosed with Type-2 diabetes and failing lifestyle changes. Each cohort was assigned to a different first-line therapy: glipizide GITS, generic metformin, or rosiglitazone. Add-on treatments occurred as necessary to achieve glycemic control. To summarize the model in an LR form, we first conducted Monte Carlo simulations (MCS) of the model for each therapy. The costs (dependent variables) estimated via 1000 MCS runs were then summarized through OLS regressions, using the most sensitive and/or relevant variables from the decision model as predictors. We then compared the results generated via each method. **RESULTS:** The projected cost differences between agents with the decision analysis and the aggregate LR form were identical: −$558 (glipizide GITS vs. metformin), −$1557 (glipizide GITS vs. rosiglitazone), and −$998 (metformin vs. rosiglitazone). The $R^2$ of the LR ranged between .49 and .53. Both methods led to identical conclusions regarding which agent was least/most expensive in >97% of cases. The accordance