4 (red) corresponded to high level of severity. For our analysis we combined zones 1 and 2 into a “low severity” class whereas zones 3 and 4 were combined into a “high severity” class. Our goal was to build predictive rules which allow forecasting of the severity class one day ahead of time using methods of artificial intelligence. We used dependent variables from a day N to predict the severity class on the day N + 1. Overall, 7001 records collected from 26 asthma patients were used in this analysis. Classification and Regression Trees (CART) algorithm was employed to develop three predictive models. Model I utilized all predictive variables, model II employed only 3 variables identified by CART as the most powerful predictors, and model III used only asthma symptom variables. RESULTS: The CART algorithm prioritized three predictor variables (normalized number of puffs of quick relief inhaler, normalized PEF, and asthma symptom score) based on their level of influence on the “asthma severity class” variable. The resulting forecast rules yielded good overall prediction success rates from both the learning (87.2%; 98.6%; 96.2%) and testing (86%; 96.5%; 95.2%) samples of models I, II, and III respectively. Moreover, it generated 63 decision rules accurately characterizing both “low” and “high” severity classes. CONCLUSIONS: CART algorithms showed acceptable accuracy in forecasting asthma exacerbations.

**PAS8**

**IMPROVING ASTHMA SELF-MANAGEMENT AND PATIENT OUTCOMES USING AN AUTOMATED PROGRAM**

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**OBJECTIVE:** The high prevalence of asthma has emerged as a major public health issue. It has been shown that patient education on self-management is an essential and effective component of chronic illness management. The objective of the current study was to report on outcomes associated with implementation of an automated patient self-management system, ALERTS®, in a primary care group practice—ProHealth Physicians (PHP).

**METHODS:** A pre/post design was employed. Patients were identified using PHP’s billing database. ALERTS® was accessed via the Internet or via a toll-free number. Patients were given real-time feedback regarding their symptom zone and actions to take based on their Asthma Action Plan. ALERTS® made reports on patients’ peak flow meter (PFM) readings available to patients and their providers. Outcomes assessed included unscheduled outpatient visits, emergency room (ER) visits, days lost from work/school, medication prescriptions, and number of outpatient procedures. Comparisons of pre/post intervention outcomes were calculated using the paired t-test, McNemar’s test for dichotomous data and Chi-Square as a comparison of proportions.

**RESULTS:** Seventy-four patients were enrolled. Patients demonstrated reductions in the number of unscheduled office visits (p = 0.033) when comparing these prior to and after ALERTS® use. Additionally, 55.9% (33/59) of participants saw an increase in their personal best PFM measurement (p < 0.001); 100% (6/6) of participants under the age of 18 saw an increase in this parameter (p = 0.027). Furthermore, participants answering the question reported missing less school/work due to their asthma (p = 0.026). There was also a trend towards reduction in limited physical activity, ER visits and prednisone use.

**CONCLUSION:** ALERTS® was successfully implemented in a multisite group practice, proving to be a useful program for improving care of chronic asthmatic patients.

**ASTHMA—Methods and Concepts**

**PAS9**

**THE PERFORMANCE OF BOOTSTRAPPING IN DISCRETE CHOICE MODELS**

**Baser O**

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**OBJECTIVE:** Discrete choice models are widely used in pharmacoeconomics. If correctly applied, bootstrapping is a useful tool for these models because small sample distributions of the dependent variables are not known. In this paper, we will show how to apply bootstrapping to have consistent and efficient estimators under discrete choice models. **METHOD:** Four common bootstrapping techniques were analyzed: paired, non-parametric, parametric, and wild bootstrapping. The extension of parametric bootstrapping for linear regression to parametric discrete choice models is presented: Let U be the probability that the binary dependent variable y = 1. Then for each application we choose y*, which is the new independent variable for each bootstrap, from Bernoulli distribution with probability of success given by U. **RESULTS:** The Market Scan® private insurance database was used in this study. The analytic sample comprised 36,341 individuals with asthma whose healthcare was provided under a variety of fee-for-service (FFS), fully capitated, and partially capitated health plans. We estimated hospitalization for FFS and non-FFS asthma patients. Logit models were selected depending on the distribution of the dependent variable. The Pearson chi-square goodness of fit test (p = 0.3742) and the Hosmer and Lemeshow test (p = 0.2904) suggested that the model fit well. Treatment patterns had no significant effect on hospitalization after controlling for demographic and clinical factors. The illness severity of the patient (proxied by the number of three-digit ICD-9 codes), however, had a positive and significant effect on hospitalization. We would not have seen this significant effect if we had chosen paired, non-parametric, or wild bootstrapping as a way to bootstrap standard errors. **CONCLUSION:** Despite the obvious benefit of bootstrapping in discrete choice models, the method should not be used blindly. Once the model is estimated under parametric assumptions, as in logit or probit models, deviations of the assumptions for bootstrapping will yield inefficient estimators.

**PAS10**

**A SYSTEMATIC OVERVIEW OF THE MEASUREMENT PROPERTIES OF THE ST. GEORGE’S RESPIRATORY QUESTIONNAIRE IN ASTHMA**

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**OBJECTIVES:** The St. George’s Respiratory Questionnaire (SGRQ) is a disease-specific instrument used to measure health-related quality of life (HRQoL) in patients with asthma. It is a 76-item questionnaire comprised of three domains: symptoms, activities, and impact. We conducted a systematic review to determine the psychometric measurement properties.

**METHODS:** We used the search terms “St. George’s Respiratory Questionnaire” and “St. George’s Respiratory Questionnaire and asthma”. All published papers and abstracts were reviewed and assessed using MEDLINE 1966–2005, April Week 2 and OVID full-text via the University of Southern California library database and Google Scholar. Citations for all abstracts and articles citing the first validation study were identified using the Science Citation Index. Inclusion criteria included clinical trials and observational studies reporting measurement properties in a...