Children's Hospital of Philadelphia PolicyLab

A Predictive Model for Identification of Children at Risk of Subsequent High-frequency Utilization of the Emergency Department for Asthma

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Asthma is the most common chronic condition among children with high-frequency emergency department (ED) utilization. Previous research has shown in outpatients seen for asthma that acute care visits predict subsequent health care utilization. Among ED patients, however, the optimal method of predicting subsequent ED utilization remains to be described. The goal of this study was to create a predictive model to identify children in the ED who are at risk of subsequent high-frequency utilization of the ED for asthma. We used 3 years of data, 2013-2015, drawn from the electronic health records at a tertiary care, urban, children's hospital that is a high-volume center for asthma care. Data were split into a derivation (50%) and validation/test (50%) set, and 3 models were created for testing: (1) all index patients; (2) removing patients with complex chronic conditions; and (3) subset of patients with in-network care on whom more clinical data were available. Each multivariable model was then tested in the validation set, and its performance evaluated by predicting error rate, calculation of a receiver operating characteristic (ROC) curve, and identification of the optimal cutpoint to maximize sensitivity and specificity. There were 5535 patients with index ED visits, of whom 2767 were in the derivation set and 2768 in the validation set. Of the 5535 patients, 125 patients (2.3%) had 4 or more visits for asthma in the outcome year. Significant predictors in models 1 and 2 were age and number of prior ED visits for asthma. For model 3 (additional clinical information available), the predictors were number of prior ED visits for asthma, number of primary care visits, and not having a controller medication. Areas under the ROC curve were 0.77 for model 1, 0.80 for model 2, and 0.77 for model 3. Administrative data available at the time of ED triage can predict subsequent high utilization of the ED, with areas under the ROC curve of 0.77 to 0.80. The addition of clinical variables did not improve the model performance. These models provide useful tools for researchers interested in examining intervention efficacy by predicted risk group.

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