A DATA-DRIVEN APPROACH TO OPTIMIZING DIS-ENROLLMENT FOR DIABETES PATIENTS IN CARE MANAGEMENT

THESIS DEFENSE

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ABSTRACT

One of the most targeted diseases for chronic care management is diabetes, a group of diseases characterized by the body’s inability to produce a sufficient amount of insulin. Currently, many diabetes management programs determine enrollment and dis-enrollment eligibility based upon a singular clinical criterion, the (glycated hemoglobin) HbA1c level. However, an abundance of literature indicates that there are many other contributors to the health of a person with diabetes, such as diet quality, blood pressure, and body mass index. Although HbA1c is useful as a current indicator of health status, by itself it is a poor predictor of future complications.

This thesis proposes the development of a clinical decision support system that uses multiple clinical indicators to help aid clinicians in determining member dis-enrollment eligibility. Data from a care management company was collected, and five different data mining models (decision tree, logistic regression, support vector machine, artificial neural network, and K-means support vector machine) were developed and compared to determine the best one for use in a decision support system. A number of measures (accuracy, sensitivity, specificity, and area under the curve) were used to evaluate the different models. The decision tree model achieved the highest accuracy (81.82%) for the identification of members eligible for dis-enrollment.

Furthermore, a systematic methodology is used to develop a data-driven Diabetes-specific Healthy Eating Index (DS-HEI) as a way to quantitatively measure diet quality of people with diabetes. This diet quality index identifies the food components (whole grain and total dairy) that significantly affect HbA1c. The DS-HEI was found to have a significant negative correlation with HbA1c score or participants of the 2007-2008 National Health and Nutrition Examination Survey (NHANES) that have 24 hour food recall data and HbA1c level available.