ABSTRACT

As care management business expands rapidly over the past decade, regulatory pressure is mounting for an efficient and standardized care management framework. This research is the first in the field to design a framework using data-driven approaches. The framework proposed in this research focuses on improving system efficiency and profitability, which are often overlooked by care management organizations. Many clinical risk adjustment models have been developed and implemented in IT systems to help identify patients for potential care management. This research is the first to build a four-step population stratification model using classification and prediction techniques that focuses on not only the identification, but also prioritization and capacity management. Unlike those population risk adjustment models that were initially developed for refining payment structures, this stratification model is specially designed for care management purposes with the ability to predict the clinical and financial impact of programs and stratify patients into programs based on capacity constraints.

This research proposed a new ensemble-based classification algorithm – Meta-learning Classification Protocol (MLCP) for population identification using frequency-based rule classification scaling, neural network, decision tree, support vector machine, and logistic regression. A Performance Weighting Prediction Protocol (PWPP) combining single-stage and two-stage generalized linear models are used to predict future program specific savings, which are then used to prioritize patients for enrollment and select primary programs. A case study is conducted in one of the leading care management organizations in New York to demonstrate the performance of the proposed framework and population stratification model. The experimental results show that the MLCP achieves higher accuracy compared to all individual classification algorithms and the classic majority voting ensemble method. The MLCP also outperforms existing population identification methods by 5%-24% in terms of classification accuracy. The PWPP shows a superior performance of two-stage generalized liner models in most tested datasets and can identify 23%-34% more future program specific savings than existing population prioritization methods for a 20% enrollment ratio. A user friendly decision support system is developed to help care management organizations with enrollment planning and modeling. Lastly, the result of this research will provide a detailed guideline to other care management organizations who might be struggling with their framework designs or simply begin to launch a set of new programs.