

Random Forest Model used to Predict the Medical Out-of-Pocket Costs of Hypertensive Patients

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Abstract

Background: Precise prediction of out-of-pocket (OOP) costs to improve health policy design is important for governments of countries with national health insurance. Controlling the medical expenses for hypertension, one of the leading causes of stroke and ischemic heart disease, is an important issue for the Japanese government. This study aims to explore the importance of OOP costs for outpatients with hypertension.

Methods: To obtain a precise prediction of the highest quartile group of OOP costs of hypertensive outpatients, we used the nationwide longitudinal data, and estimated a random forest (RF) model with attention to complications with other lifestyle-related diseases and nonlinearities of the data.

Results: The results of RF models showed that the prediction accuracy of OOP costs for hypertensive patients without activities of daily living (ADL) difficulties was slightly better than that for all hypertensive patients who continued physician visits during the past two consecutive years. Variables of importance of the highest quartile of OOP costs were age, diabetes or lipidemia, lack of habitual exercise, and moderate or vigorous regular exercise.

Conclusion: As preventing complications of diabetes or lipidemia is important for reducing OOP costs in outpatients with hypertension, regular exercise of moderate or vigorous intensity is recommended for hypertensive patients that do not have ADL difficulty. For hypertensive patients with ADL difficulty, habitual exercise must not be remedied.

Keywords: activities of daily living (ADL); exercise; hypertension; Japan; out-of-pocket (OOP) costs; prediction; random forest