Chapter 9

Predictive Modelling and Mind-Set Segments Underlying Health Plans

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ABSTRACT

Health systems are facing austerity negatively affecting the delivery of services around the world. This chapter defines predictive analytics in health, discusses how predictive analytics may contribute to health promotion and demonstrates the identification of specific communication elements to be used by health maintenance organizations and insurers to shape health plans in accordance to mind-set segments of patients. Although the application of predictive analytics to health plans may reduce costs and shift the focus of health systems from treating the sick to preventive medicine, it has not been investigated and is the topic of this chapter.

INTRODUCTION

Predictive analytics (PA) is the branch of data mining concerned with the prediction of future probabilities and trends. The central element of PA is the predictor, a variable that can be measured for an individual or other entity to predict future behavior. For example, an insurance company is likely to take into account potential driving safety predictors such as age, gender, and driving record when issuing car insurance policies. When multiple predictors are at issue they are combined into a predictive model,
which, when subjected to analysis, can be used to forecast future probabilities with an acceptable level of reliability. In predictive modeling, data is collected, a statistical model is formulated, predictions are made and the model is validated (or revised) as additional data becomes available. PA is applied to many research areas, including meteorology, security, genetics, economics, marketing and recently to health. This chapter focuses on PA and health and more specifically on PA analysis and delivery of health care services.

BACKGROUND

Historically, medicine has been consumed by care of the sick rather than with preventive healthcare. Physicians often wait until illness surfaces and then try their best to treat that person. PA can be used to avoid illness and learn what will promote health. PA may revolutionize the way medicine is practiced today for better health, higher disease reduction and customized health plans (Kohane, Drazen & Campion, 2012). PA posits the potential to promote public health by predicting outcomes for individual patients. Even if physicians had access to the massive amounts of data needed to compare treatment outcomes for all the diseases they encounter, they would still need time and expertise to analyze the information and integrate it with the patient’s own medical profile. This in-depth research and statistical analysis is beyond the scope of a physician’s work, particularly facing today’s global shortage in physicians and austerity in health systems (Crisp & Chen, 2014).

PA may include data from past treatment outcomes as well as from the latest medical research published in peer-reviewed journals and databases. PA not only helps with predictions, but may also reveal surprising associations in data. Predictions can range from responses to medications to hospital readmission rates. For example, predicting infections from methods of suturing, determining the likelihood of disease, helping a physician with a diagnosis, and even predicting future wellness. PA differs from traditional statistics and from evidence-based medicine. First, predictions are made for individuals and not for groups, with the ability to predict behaviors (McEachan, Conner, Taylor et al., 2011). Second, PA does not rely upon a normal (bell-shaped) curve as what may work best for people in the middle of a normal distribution may not work best for an individual patient seeking treatment. PA can help physicians decide the exact treatments for those individuals as it is wasteful and potentially dangerous to provide treatments that are not needed or that will not work for a certain individual. Better diagnoses and more targeted treatments will naturally lead to increases in good outcomes and less depletion of resources, including time of physicians.

Hospitals will need predictive models to accurately assess when a patient can safely be released. PA also increases the accuracy of diagnoses. For example, when patients come to the ER with chest pain, it is often difficult to know whether the patient should be hospitalized. If physicians were able to answer questions about the patient and his condition using a system with a tested and accurate predictive algorithm, the likelihood that the patient could be sent home safely may be assessed. The prediction would not replace their judgments but rather would assist it (Miner, Bolding, Hilbe et al, 2014).

PA will also promote preventive medicine and public health. With early intervention, many diseases can be prevented or ameliorated. PA may allow primary care physicians to identify at-risk patients within their practice. With that knowledge, patients can make lifestyle and behavioral changes to avoid risks (Armstrong, Garrett-Mayer, Yang, et al., 2007; Rise, Kovac, Kraft et al., 2008). As lifestyles change,