STATISTICAL SIGNIFICANCE

The 2009 mandate[1] incentivizing health care providers to digitize medical records was met with a groan from many hospital and clinic workers. But now, over two years after the "deadline" for adoption, statistical inference and prediction based on electronic health records have become a game-changer in driving efficiency in health spending and treatment.

Health Informatics

IDENTIFYING COST-EFFECTIVE HEALTHCARE PAYMENT SCHEMES: The U.S. spends more than any other nation on healthcare, and much of this spending is preventable. From 2011 to 2012, an estimated 30% of Medicare dollars was provided to health care providers unnecessarily, totaling roughly $300 billion in preventable Medicare costs and $910 billion in preventable U.S. health expenditures as a whole[2]. The magnitude of these expenses has motivated the U.S. government to transition away from legacy "fee-for-service" health care payment schemes, in which health care providers are paid per treatment they deliver, which incentivizes the design of costly treatment plans involving many procedures. Instead, Centers for Medicare & Medicaid Services is exploring *prospective payment*, in which the amount health care providers are paid to treat a patient is determined before treatment, incentivizing healthcare providers to pursue treatment plans that lower long-term costs of care. But putting this plan into use depends on how accurately patient costs can be predicted. Historically, only a few pieces of patient information have been included to assess the financial risk a patient poses to a hospital, such as age, sex, race, and diagnoses. But electronic health records provide much more information for predicting cost, from drugs the patient has received to observations from nurses' flow charts. This additional data, in combination with methods that "learn" how interactions between patient factors predict costs, paves the way more cost-effective payment schemes.

ASSIGNING PATIENTS TO APPROPRIATE TREATMENT SCHEMES: Patients don't all cost the same; historically, 5% of patients in the U.S. account for 50% of the nation's medical costs. By mining electronic health records, health care providers are able to identify patients who are most likely most likely to undergo expensive procedures in the future. By classifying patients into groups based on their expected costs, hospitals can decide whether to assign a patient to an alternative care program. One example is the Comprehensive Care Physician Program at the University of Chicago Hospitals, in which a patient receives care from the same doctor for all medical procedures in both the clinic and the hospital. Selecting the "right" patients (i.e., the ones that will actually be most costly in the future) to receive these specialized treatment programs is one more way to minimize the costs of potentially expensive patients.

FIGURE: Learned relationships between medical variables can be used to predict patient costs and assign high-risk patients to treatment groups.

[1]American Recovery and Reinvestment Act of 2009

[2]Office of the National Coordinator for Health IT, 2015