Developing Treatment Policies for Complex Patients Using Modeling and Data Mining

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Description

Patients with type 2 diabetes have high risk for cardiovascular events, and the risk derives from multiple sources, including elevated glucose, blood pressure, lipids, and other factors. Single-disease, evidence-based clinical guidelines are the norm for guiding treatment decisions, but few have been tested for their benefits or drawbacks when applied to the care of complex patients. This research used computational modeling and data mining techniques to estimate the relative impact on cardiovascular events and on cost of treatment of competing clinical approaches used to treat complex patients with diabetes.

Specific Aims

1. Develop modeling methodology to: (1) determine the difference in cardiovascular event risk reduction of treatment strategies that prioritize blood pressure, glucose, or lipid control versus those that do not; (2) assess the relative merits and drawbacks of "feedforward" versus typical "feedback" clinical decisionmaking strategies; and (3) estimate the variation in pharmaceutical costs associated with treatment strategies that reduce cardiovascular risks to various specified levels.
2. Use data mining techniques to identify the optimal combinations of pharmaceutical agents to minimize pharmaceutical costs while achieving pre-specified degrees of risk reduction for major cardiovascular complications in complex patients with diabetes.

Findings

- Complex patients with diabetes benefit when their care is personalized to match treatment strategies with their individual characteristics.
- Data mining algorithms, specifically decision trees, can be used to more precisely classify patients and match them with appropriately customized treatments, thus improving care for their complex conditions.

Main Objective

Use simulations to model the optimal combination of pharmaceutical agents to structure clinical policies that are most effective in reducing risk of cardiovascular events in complex patients with diabetes.

Chronic Conditions Considered

Type 2 diabetes

Preventive Service Considered

This project did not address a specific clinical preventive service

Study Design, Data Sources & Sample Size

Modeling and data mining

Strategies Addressed from the HHS Strategic Framework on Multiple Chronic Conditions

1.D. Implement and successfully use health information technology

3.A. Identify best practices and tools

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- A risk-based strategy to prioritize treatments can help prevent future complications in complex patients with diabetes.

Implications

The combination of computational modeling and data mining techniques enables a new and practical approach to identifying and validating clinical policies that can maximize outcomes for complex patients and that can provide valuable information on the cost of treatment strategies with well-defined clinical benefits.

Publications (as of September 2013)

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