Algorithmic Development of Asthma Action Plans

Asthma is a lung condition that imposes a significant burden on patients’ daily lives. Escalations of this condition (or exacerbations) are a frequent trigger of physician and hospital visits which are both costly and distressing to patients. The need for novel solutions that limit the impact of exacerbations on global health is abundantly apparent.

One emerging approach to addressing asthma exacerbation is early detection by way of mobile app technology. Many of these apps, however, utilize rule based decision frameworks, which are constantly hampered by the size of the variable space involved in triage and diagnosis. Revon has responded to this problem by developing mobile disease management applications that leverage machine learning predictions when guiding patients. This approach has the advantage of incorporating the inherent complexity and interdependencies prevalent in the relevant health variables that influence asthma exacerbations.

In MPI 2018, we are interested in two major problems:
1) Developing a feature of a mobile asthma management application called a smart action plan. In particular, this feature would tell patients how to adjust their inhaler usage, controller medication, and what type of medical help to seek as a function of the symptoms that they are presenting. The action plan would be the output of a mathematical modeling prediction which would be made as a function of a large variable space including patient vital signs, symptoms, and profile history. Data sets will be provided by Revon.

2) A detailed analysis of the patient usage and health efficacy data that has come out of patient pilot testing populations in our existing asthma and copd management applications. Some of the questions that we will hope to answer include:
   a) What type of patient is most likely to get health benefit from our application?
   b) What type of patient is most likely to download our application and persistently use it over time?
   c) What are the most important features in predicting patient benefit and usage?
   d) Can we predict when patient feedback is accurate?