To be or not to be ill: How to predict the risk of diseases precisely?

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The understanding of causes of diseases is essential for their prevention and treatment. The causality between an etiological factor and a specific disease is always a challenge to medical scientists. Robert Koch's four postulates have been regarded as the gold standard to judge whether an organism is the specific cause of an infectious disease. There are exceptions to the one-to-one postulates. For example, Koch found that not all persons infected by *Vibrio cholerae* developed the disease.

Koch postulates are usually not applicable to non-communicable diseases. For examples, liver cancer may be caused by hepatitis B virus, hepatitis C virus, habitual alcohol consumption, aflatoxin exposure, and obesity. Long-term exposure to arsenic in drinking water may cause various health hazards including cardiovascular diseases, cancers, diabetes, hypertension and cataract. Furthermore, only a proportion of exposed individuals is affected with the disease, and only a proportion of affected individuals are caused by one agent.

The development of most diseases is a multistage progress with the involvement of a multifactorial etiology including agent, host and environmental factors. The risk of disease associated with the exposure to an etiological factor is stochastic rather than deterministic, just as said by William Osler, "Medicine is a science of uncertainty and an art of probability." The prediction of the risk of disease and the benefit of clinical management becomes essential for the daily practice of healthcare workers.

Precision medicine refers to the tailoring of medical treatment to the individual characteristics of each patient. It implies the ability to classify individuals into subpopulations that differ in their susceptibility to a particular disease, in the prognosis of those diseases they may develop, or in their response to a specific treatment. Predictive Medicine entails predicting the probability of disease and instituting preventive measures in order to either prevent the disease or significantly decrease its impact upon the patient by preventing mortality or limiting morbidity.

Risk calculators are widely used for the prediction of long-term risk of disease development and progression. Risk calculators integrates several risk predictors into one measure of absolute risk using a regression model, usually in the form of risk score. Uncertainty about

clinical interpretation of a single risk predictor could be improved by the use of this method. It allows for appropriate recognition of clinically important risk in persons with several but seemingly marginal risk predictors that may otherwise not raise clinical concerns.

Along with the rapid development in panomics, each individual will have a virtual cloud of billions of biomarkers in coming decades. Through the analysis of the health data cloud using artificial intelligence, it becomes possible to predict health status and treatment response by monitoring self-parameters. Guidelines about how to optimize wellness and minimize disease for each individual may be generated in near future using **A**rtificial intelligence, multiple **B**iosignatures, and health **C**loud. The **ABC** will transform the practice of medicine over the next decade, moving it from largely provider-driven reactive disease treatment to consumer-driven proactive disease prevention.