Bayesian adaptive designs – from theory to practice

Invited Talk by Professor Jack Lee, University of Texas MD Anderson Cancer Center

Abstract:

Clinical trial is a prescribed learning process for identifying safe and effective treatments. In recent years, rapid advancements in cancer biology, immunology, genomics, and therapeutics demand innovative methods to identify better treatments for the most appropriate populations in a timely, efficient, accurate, and cost-effective way. In my talk, I will first illustrate Bayesian update using Shiny applications we developed. Bayesian methods take the "learn as we go" approach and are innately suitable for clinical trials. Then, I will give an overview of Bayesian adaptive designs in the areas of adaptive dose finding, posterior and predictive probability calculations for toxicity and efficacy monitoring, outcome adaptive randomization, multi-arm platform design, and hierarchical modeling, etc. Finally, real applications including BATTLE trials in lung cancer, I-SPY 2 trials in breast cancer, GBM-Agile in glioblastoma, and the MD Anderson experience on implementing Bayesian trials will be given. Bayesian adaptive clinical trial designs increase the study efficiency, allow more flexible trial conduct, and treat more patients with more effective treatments in the trial but also possess desirable frequentist properties. Perspectives will be given on bringing theory to practice to enhance the clinical trial success and speed up approval of effective treatments. Many useful software tools for trial design, simulating operating characteristics, and trial conduct are freely available at the followings three sites.
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