MIDAS: A Practical Bayesian Design for Platform Trials with Immunotherapy Agents

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Recent success of immunotherapy and other targeted therapies in cancer treatment has led to an unprecedented surge in the number of novel therapeutic agents that need to be evaluated in clinical trials. Traditional phase II clinical trial designs were developed for evaluating one candidate treatment at a time, and have significant shortcomings that make them unsuitable for this task. We propose a Bayesian platform design, the Multi-candidate Iterative Design with Adaptive Selection (MIDAS), which allows investigators to continuously screen a large number of candidate agents in an efficient and seamless fashion. MIDAS consists of one control arm, which contains a standard therapy as the control, and several experimental arms, which contain the experimental agents. Patients are adaptively randomized to the control and experimental agents based on their estimated efficacy. During the trial, we adaptively drop inefficacious or overly toxic agents and ``graduate" the promising agents from the trial to the next stage of development. Whenever an experimental agent graduates or is dropped, the corresponding arm opens immediately for testing the next available new agent. Simulation studies show that MIDAS substantially outperforms the conventional approach. The proposed design yields a significantly higher probability for identifying the promising agents and dropping the futile agents. In addition, MIDAS requires only one master protocol, which streamlines trial conduct and substantially decreases the overhead burden. Although we emphasize immunotherapy agents, MIDAS can be directly used to evaluate other agents.