

Covariate balance among different treatment arms is critical in clinical trials, as confounding effects can be effectively eliminated when patients in different arms are alike. To balance the prognostic factors across different arms, we propose a new dynamic allocation scheme for patient allocation. Our approach does not need to discretize continuous covariates to multiple categories, and it can handle both the continuous and discrete covariates in a natural way. This is achieved through devising a statistical measure to characterize the similarity between a new patient and all existing patients in the trial. Under the similarity weighting scheme, we develop a covariate adaptive biased coin design and establish its theoretical properties, as well as improving the original Pocock and Simon design. We conduct extensive simulation studies and a real data case study to examine the design operating characteristics. The new approach is demonstrated to perform superior over other existing methods.