Effects of allocation method and time trends on identification of the best arm in multi-arm trials

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Introduction

This repository includes R code to reproduce the simulations and recreate the results figures within this manuscript. The original simulations were run on a computing system with several hundred threads. Modifications should be made if running this code on a personal computer by running only a subset of scenarios or reducing the number of simulation iterations. ***This code is intellectual property of Berry Consultants.***

Description of contents

- ***utilities.R:*** Contains a set of utility functions that are used in the simulation code.
- ***simulation_functions.R:*** Contains a set of functions for running the clinical trial simulations including the functions "runonetrial" and "runmanytrialsinparallel".
- ***run_simulations_parallel.R****:* Code to run selected simulation scenarios from the *simulation_scenario_grid.csv* file
- ***simulation_scenario_grid.csv****:* A file including the grid of 700 simulation scenarios simulated within paper
- ***processing_get_success_thresholds.R:*** Code to calculate the success threshold for each design that controls the type I error rate under the null efficacy scenario and flat time scenario
- ***processing_compute_OCs.R:*** Code to compute the operating characteristics for each design under each scenario
- ***processing_create_figures.R:*** Code to read in OC file and create figures from manuscript

Running the simulations

Ensure that the following packages are installed in R: dplyr, gsDesign, rstanarm, VGAM, gsl, parallel, foreach, doParallel, doRNG, colorspace, ggplot2. Within the command line interface (e.g., Terminal/Command Prompt), navigate to the working directory that includes the folder of code. Run the following command:

nohup Rscript run_simulations_parallel.R $"X" $"Y" $"Z" > log.out &

This code will run the file *run_simulations_parallel.R* with the input arguments of X, Y, and Z. The variables X and Y are placeholders for the simulation scenarios to run from the list of scenarios within the *simulation_scenario_grid.csv* file. For example, setting X = Y = 1 will run the first simulation scenario and setting X = 1 and Y = 700 will run all 700 simulation scenarios. The variable Z is a placeholder for the random number generator seed to use for the simulations. To recreate the manuscript results exactly, a seed of Z = "20220524" should be used. Output will be saved into the "SimOutput" folder.

Processing the simulations

Once the simulations have been run, the following steps should be taken to process the results and create results figures:

1. Run the *processing_get_success_thresholds.R* file to calculate the success threshold for each design that control type I error under the "Flat" time trend scenario.
2. Run the *processing_compute_OCs.R* file to compute summaries of the operating characteristics of each design.
3. Run the *processing_create_figures.R* file to create the figures included within the manuscript and supplement.

Output will be saved in the "Figures" folder.