BOIN Design Simulation Set-up

Yanruyu Zhu (yaz4004)

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Objective

Replication of Bayesian Optimal Interval Design: A Simple and Well-Performing Design for Phase I Oncology Trials by Yuan et al.

Simulation setting

- 5 Dose levels;
- Max sample size: 30 patients;
- Number of Cohorts: 10;
- Dose Limiting Toxicity (DLT) rate: 15%, 20%, 25%, 30%;
- For each DLT, 16 toxicity scenarios (location of MTD and gaps around MTD);
- Under each scenario (see ToxicityScenarios_DLTrates.xlsx), do 10,000 trails.

- Traditional 3+3

- Dose level 1: $A\ B\ C$ (Cohort 1)
  - 0 DLT (0 out of 3): $D\ E\ F$ at Dose level 2;
  - 1 DLT (1 out of 3): $D\ E\ F$ at Dose level 1;
    - 0 DLT (1 out of 6): $G\ H\ I$ at Dose level 2.
- IF >1 DLT out of 3 or 6 THEN Current dose level ($Dose_i$) > MTD:
  - IF less than 6 patients have already been at $Dose_{i-1}$, THEN add a cohort of 3 at $Dose_{i-1}$;
  - IF 6 patients have already been at $Dose_{i-1}$, THEN $Dose_{i-1} = MTD$;
  - IF $Dose_{i-1} = Dose_1$, THEN the trial is terminated and the MTD is not found.
- Remaining patients are considered treated at the selected MTD.

- Local BOIN

Boundaries

- Global BOIN

Boundaries

Data generation

how are the trial data (not the dose scenario) in each simulation generated?

BOIN_SuyuLiu&YingYuan.pdf
Fig.3 replicate in Simulation.Rmd

Package

BOIN

BOIN2.4_manual.pdf
BOIN2.4_tutorial.pdf

Escalation

Info Website:
https://cran.r-project.org/web/packages/escalation/vignettes/A700-Simulation.html

STAN

Performance metrics

- Percentage of correct selection (PCS) of the MTD

Percentage of correct selection (PCS) of the true MTD in 10000 simulation trials.

- Average number of patients allocated to the MTD

- Risk of overdosing

- Risk of underdosing