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Risk-Averse Treatment Allocation in Clinical Trials: A Multiarmed Bandit Design

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Multiarmed bandit problems (MABs) present a class of optimal control problems well-suited for modeling resource allocation under uncertainty. This study explores the application of MABs in the context of clinical trial design. While traditional risk-neutral MABs aim to maximize the expected total number of effective treatments, this study considers the limitations of this objective, as treatments that perform well on average may exhibit significant variability and adverse effects for certain patients. To address this, a novel risk-averse MAB approach using dynamic risk measures is introduced for treatment allocation, employing a Bayesian Bernoulli model. The performance of this approach is evaluated against other allocation rules, including fixed randomization. The findings shed light on the benefits of incorporating risk-averse strategies in clinical trial designs, offering insights for more effective and patient-centric decision-making.

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