

## **Flexible sequential designs for multi-arm clinical trials**

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Adaptive designs that are based on group-sequential approaches have the benefit of being efficient as stopping boundaries can be found that lead to good operating characteristics with test decisions based solely on sufficient statistics. The drawback of these so called 'pre-planned adaptive' designs is that unexpected design changes are not possible without impacting the error rates. 'Flexible adaptive designs' on the other hand can cope with a large number of contingencies at the cost of reduced efficiency. In this work, we focus on two different approaches for multi-arm multi-stage trials, which are based on group-sequential ideas, and discuss how these 'pre-planned adaptive designs' can be modified to allow for flexibility. We then show how the added flexibility can be used for treatment selection and sample size reassessment and evaluate the impact on the error rates in a simulation study. The results show that an impressive overall procedure can be found by combining a well chosen pre-planned design with an application of the conditional error principle to allow flexible treatment selection.