

## Supplemental Results

Table S1 Rejection rate, and percent on experimental arm for fixed-ratio (1:1 and 1:2 ratios) and adaptive randomization designs without early stopping.

Response Rate		Fixed Ratio 1:1 Randomization	Fixed Ratio 1:2 Randomization	Adaptive Randomization 1 $c = n / (2N)$		Adaptive Randomization 2 $c = (n / N)^{0.1}$	
		N=134	N=153	N=140		N=184	
Cntl	Exp	Rejection Rate (Power)	Rejection Rate (Power)	Rejection Rate (Power)	% on Exp Arm	Rejection Rate (Power)	% on Exp Arm
0.2	0.05	0.00	0.00	0.00	32.5	0.00	19.3
0.2	0.2	0.10	0.10	0.10	50.0	0.10	50.0
0.2	0.4	0.90	0.90	0.90	67.5	0.90	80.6
0.2	0.6	1.00	1.00	1.00	76.2	1.00	85.9
0.2	0.8	1.00	1.00	1.00	80.0	1.00	87.1
0.2	0.95	1.00	1.00	1.00	81.8	1.00	87.4

Cntl: Control Arm; Exp: Experimental Arm; Resp: Response.

Table S2: Rejection rate, efficacy stopping rate, futility stopping rate, and percentage on experimental arm for equal and adaptive randomization designs with both futility and efficacy early stopping.

True Response Rate		Equal Randomization			Adaptive Randomization 1 $c = n / (2N)$				Adaptive Randomization 2 $c = (n / N)^{0.1}$			
Cntl ( $p_1$ )	Exp ( $p_2$ )	$N_{\max}=190$			$N_{\max}=208$				$N_{\max}=274$			
		Rejection Rate (power)	Efficacy Stopping Rate	Futility Stopping Rate	Rejection Rate (power)	Efficacy Stopping Rate	Futility Stopping Rate	% on Exp Arm	Rejection Rate (power)	Efficacy Stopping	Futility Stopping	% on Exp Arm
0.2	0.05	0.00	0.00	0.92	0.00	0.00	0.93	43.0	0.00	0.00	0.88	22.9
0.2	0.2	0.10	0.10	0.12	0.10	0.10	0.12	50.0	0.10	0.10	0.10	50.0
0.2	0.4	0.90	0.89	0.01	0.90	0.90	0.01	57.1	0.90	0.89	0.01	74.5
0.2	0.6	1.00	1.00	0.00	1.00	1.00	0.00	52.8	1.00	1.00	0.00	70.5
0.2	0.8	1.00	1.00	0.00	1.00	1.00	0.00	51.4	1.00	1.00	0.00	66.0
0.2	0.95	1.00	1.00	0.00	1.00	1.00	0.00	51.0	1.00	1.00	0.00	63.6

Cntl: Control Arm; Exp: Experimental Arm; Resp: Response; Avg: Average;  $N_{\max}$ : Maximum sample size.

Table S3: Rejection rate, efficacy stopping rate, futility stopping rate, and percentage on experimental arm for the three-arm equal randomization and adaptive randomization designs with both futility and efficacy early stopping.

True Response Rate			Equal Randomization			Adaptive Randomization 1 $c = n / (2N)$						Adaptive Randomization 2 $c = (n / N)^{0.1}$					
Cntl ( $p_1$ )	Exp 1 ( $p_2$ )	Exp 2 ( $p_3$ )	$N_{\max}=231$			$N_{\max}=255$						$N_{\max}=321$					
			Rejection Rate (Power)	Efficacy Stopping Rate	Futility Stopping Rate	Rejection Rate (Power)	% on Control Arm	% on Exp1 Arm	% on Exp2 Arm	Efficacy Stopping Rate	Futility Stopping Rate	Rejection Rate (Power)	% on Control Arm	% on Exp1 Arm	% on Exp2 Arm	Efficacy Stopping Rate	Futility Stopping Rate
0.2	0.05	0.05	0.00	0.00	0.91	0.00	36.3	31.8	31.9	0.00	0.95	0.00	46.4	26.8	26.8	0.00	0.99
0.2	0.2	0.2	0.10	0.10	0.10	0.10	33.4	33.3	33.3	0.10	0.11	0.10	33.3	33.3	33.4	0.10	0.11
0.2	0.4	0.4	0.90	0.89	0.00	0.90	29.4	35.3	35.3	0.89	0.00	0.90	19.7	40.1	40.2	0.90	0.00
0.2	0.6	0.6	1.00	1.00	0.00	1.00	31.9	34.1	34.0	1.00	0.00	1.00	21.1	39.4	39.5	1.00	0.00
0.2	0.8	0.8	1.00	1.00	0.00	1.00	32.7	33.6	33.7	1.00	0.00	1.00	22.9	38.6	38.5	1.00	0.00
0.2	0.3	0.5	0.97	0.97	0.00	0.98	31.4	32.7	35.9	0.98	0.00	0.99	23.4	29.4	47.2	0.99	0.00
0.2	0.4	0.6	1.00	1.00	0.00	1.00	31.8	33.5	34.7	1.00	0.00	1.00	22.6	32.8	44.6	1.00	0.00
0.2	0.4	0.8	1.00	1.00	0.00	1.00	32.8	33.2	34.0	1.00	0.00	1.00	25.5	30.6	43.9	1.00	0.00
0.2	0.1	0.6	1.00	1.00	0.00	1.00	33.9	30.4	35.7	1.00	0.00	1.00	29.7	21.3	49.0	1.00	0.00
0.2	0.2	0.4	0.77	0.76	0.01	0.83	32.3	29.8	37.9	0.82	0.01	0.92	26.6	23.2	50.2	0.91	0.01
0.2	0.2	0.6	1.00	1.00	0.00	1.00	33.1	31.6	35.3	1.00	0.00	1.00	27.4	24.5	48.1	1.00	0.00
0.2	0.2	0.8	1.00	1.00	0.00	1.00	33.2	32.6	34.2	1.00	0.00	1.00	28.1	26.0	45.9	1.00	0.00

Cntl: Control Arm; Exp: Experimental Arm; Resp: Response; Avg: Average;  $N_{\max}$ : Maximum sample size.

Table S4 : Performance of equal and adaptive randomization designs for survival analysis with both futility and efficacy early stopping.

True Median Survival Time		Constants of Exponential Distribution		Equal Randomization			Adaptive Randomization 1 $c = n / (2N)$				Adaptive Randomization 2 $c = (n / N)^{0.1}$			
Cntl	Exp	Cntl ( $\mu_1$ )	Exp ( $\mu_2$ )	$N_{\max}=170$			$N_{\max}=180$				$N_{\max}=218$			
				Rejection Rate (Power)	Efficacy Stopping Rate	Futility Stopping Rate	Rejection Rate (Power)	Efficacy Stopping Rate	Futility Stopping Rate	% on Exp. Arm	Rejection Rate (Power)	Efficacy Stopping Rate	Futility Stopping Rate	% on Exp. Arm
0.69	0.35	1.00	0.50	0.99	0.81	0.00	0.99	0.83	0.00	41.4	0.99	0.80	0.00	24.9
0.69	0.52	1.00	0.75	0.55	0.13	0.11	0.55	0.14	0.13	43.5	0.55	0.14	0.15	32.6
0.69	0.69	1.00	1.00	0.10	0.02	0.26	0.10	0.02	0.34	50.0	0.10	0.02	0.47	50.1
0.69	0.87	1.00	1.25	0.38	0.08	0.13	0.39	0.09	0.17	54.8	0.39	0.09	0.22	63.4
0.69	1.04	1.00	1.50	0.80	0.26	0.02	0.80	0.26	0.03	57.5	0.80	0.27	0.05	70.0
0.69	1.21	1.00	1.75	0.96	0.50	0.00	0.97	0.52	0.00	58.6	0.96	0.65	0.00	72.3
0.69	1.39	1.00	2.00	0.99	0.70	0.00	0.99	0.73	0.00	58.7	0.99	0.76	0.00	73.1
0.69	2.08	1.00	3.00	1.00	0.98	0.00	1.00	0.99	0.00	57.2	1.00	0.99	0.00	71.7

Cntl: Control Arm; Exp: Experimental Arm