

R Notebook for the cystectomy study

Pascal Jerney

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## Loading required package: pacman
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1 Index

Welcome to the notebook!

1.1 Table 1

	FALSE	TRUE	p	test
n	798	369		
blood_loss_ml (median [IQR])	900.00 [700.00, 1245.00]	1400.00 [1000.00, 2100.00]	<0.001	nonnorm
blood_loss_ratio (median [IQR])	0.19 [0.14, 0.26]	0.31 [0.22, 0.42]	<0.001	nonnorm
oak = TRUE (%)	23 (2.9)	21 (5.7)	0.029	
tcaggr = TRUE (%)	87 (10.9)	40 (10.8)	1.000	
preop_hb (median [IQR])	135.00 [123.00, 145.00]	120.00 [104.00, 130.00]	<0.001	nonnorm
preop_tc (median [IQR])	251.50 [211.00, 309.00]	267.00 [214.00, 339.00]	0.003	nonnorm
bmi (median [IQR])	25.56 [22.86, 28.72]	25.39 [22.71, 28.52]	0.701	nonnorm
age (median [IQR])	67.08 [59.21, 74.29]	71.03 [64.04, 77.48]	<0.001	nonnorm
cci_5plus (%)			<0.001	
0	304 (38.1)	106 (28.7)		
1	131 (16.4)	48 (13.0)		
2	181 (22.7)	89 (24.1)		
3	98 (12.3)	56 (15.2)		
4	55 (6.9)	37 (10.0)		
5 and more	29 (3.6)	33 (8.9)		
gender = female (%)	239 (29.9)	140 (37.9)	0.008	
p_tumor (%)			<0.001	
0	201 (25.2)	58 (15.7)		
1	111 (13.9)	38 (10.3)		
2	193 (24.2)	75 (20.3)		
3	233 (29.2)	129 (35.0)		
4	60 (7.5)	69 (18.7)		
p_nodes (%)			0.002	
0	631 (79.1)	266 (72.1)		
1	73 (9.1)	40 (10.8)		
2	69 (8.6)	57 (15.4)		
3	25 (3.1)	6 (1.6)		
op_year (%)			<0.001	
2000	14 (1.8)	35 (9.5)		
2001	25 (3.1)	29 (7.9)		
2002	27 (3.4)	19 (5.1)		
2003	54 (6.8)	21 (5.7)		
2004	43 (5.4)	26 (7.0)		
2005	31 (3.9)	17 (4.6)		
2006	30 (3.8)	26 (7.0)		
2007	46 (5.8)	30 (8.1)		
2008	69 (8.6)	19 (5.1)		
2009	47 (5.9)	18 (4.9)		
2010	70 (8.8)	22 (6.0)		
2011	69 (8.6)	22 (6.0)		
2012	52 (6.5)	29 (7.9)		
2013	74 (9.3)	18 (4.9)		
2014	64 (8.0)	15 (4.1)		
2015	53 (6.6)	12 (3.3)		
2016	30 (3.8)	11 (3.0)		
op_duration_min (median [IQR])	390.00 [345.00, 425.75]	408.00 [350.00, 451.00]	<0.001	nonnorm
previous_op = TRUE (%)	326 (40.9)	161 (43.6)	0.406	
norepinephrine = TRUE (%)	519 (65.0)	203 (55.0)	0.001	
crystalloids_mlkgh (median [IQR])	4.50 [3.30, 6.01]	5.30 [3.79, 7.09]	<0.001	nonnorm
neoadj_chemo = TRUE (%)	101 (12.7)	75 (20.3)	0.001	

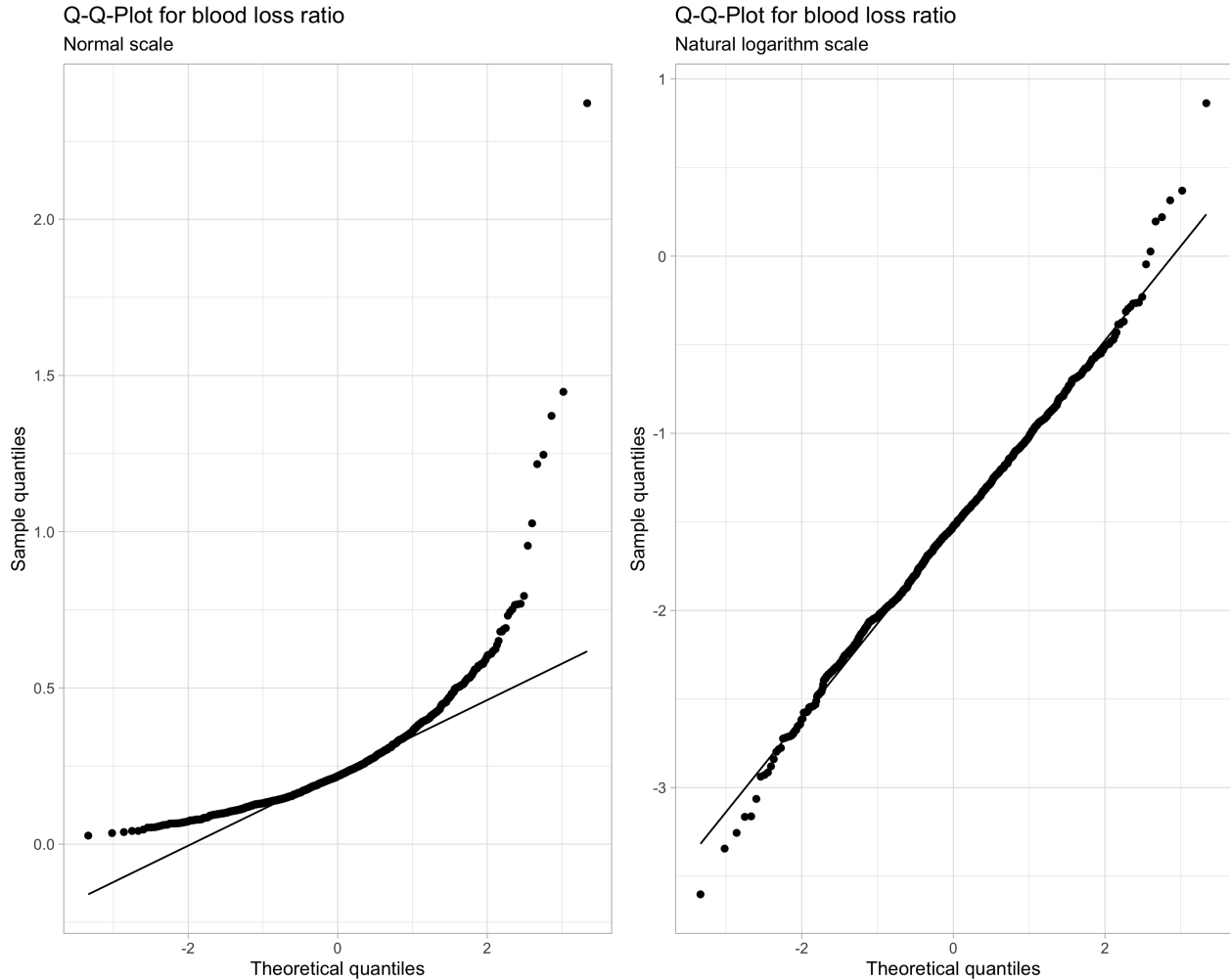
2 Prerequisites

2.1 Formulas

- Indexed blood volume¹: $BV_i = \frac{70}{\sqrt{\frac{BMI}{22}}}^2$
- Estimated blood volume: $BV_e = BV_i \cdot Weight^3$
- Blood loss ratio: $BL_r = \frac{BV_e^4}{BL_a}$
- Standardization method for age and bmi⁵: $M_i = \frac{0.6745(x_i - \tilde{x})}{2 \cdot MAD}^6$

3 Results

3.1 Data plots



¹Lemmens, H. J. M., Bernstein, D. P., & Brodsky, J. B. (2006). Estimating blood volume in obese and morbidly obese patients. *Obesity Surgery*, 16(6), 773–776. <https://doi.org/10.1381/096089206777346673>

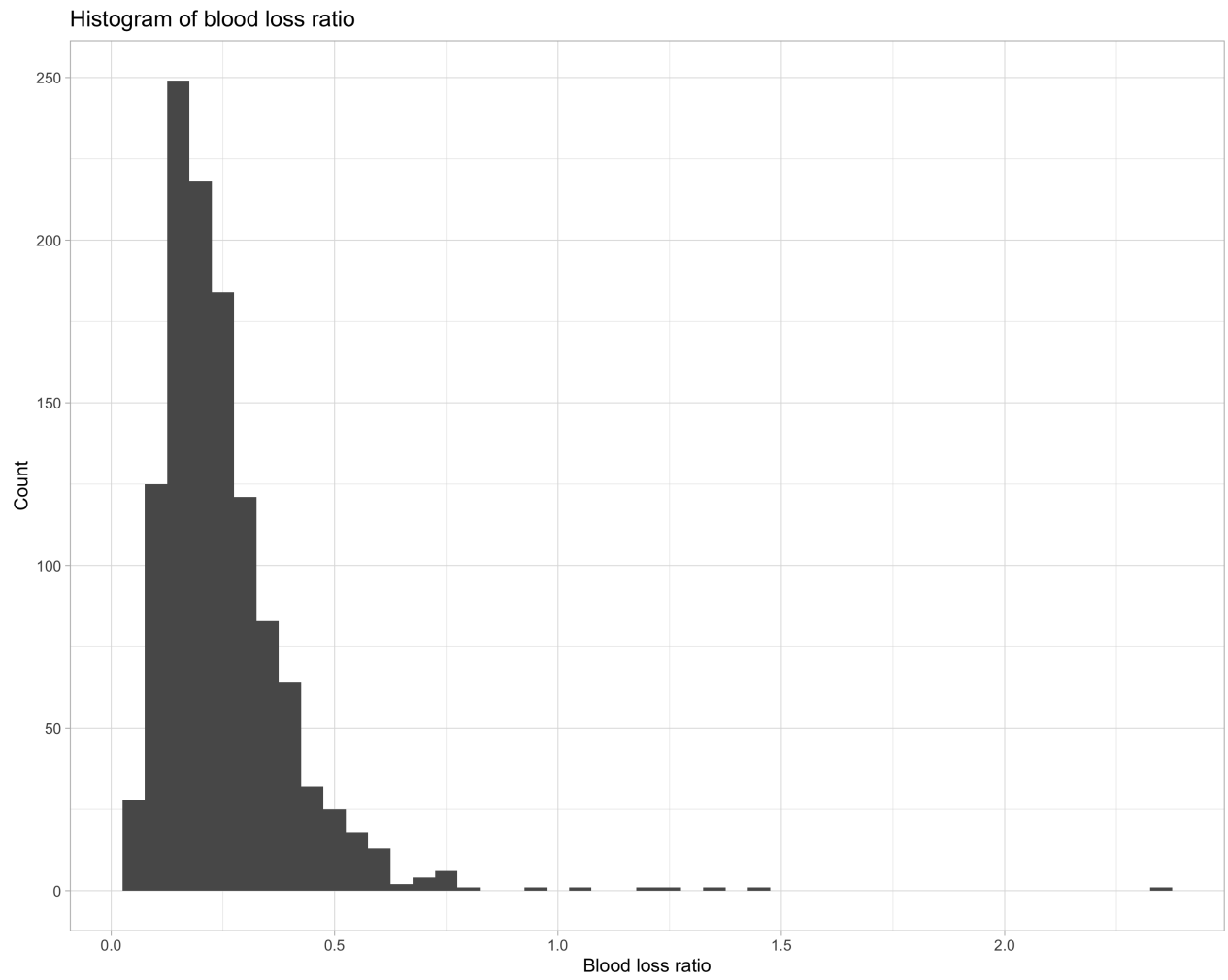
² BV_i = Indexed blood volume, BMI = Body mass index

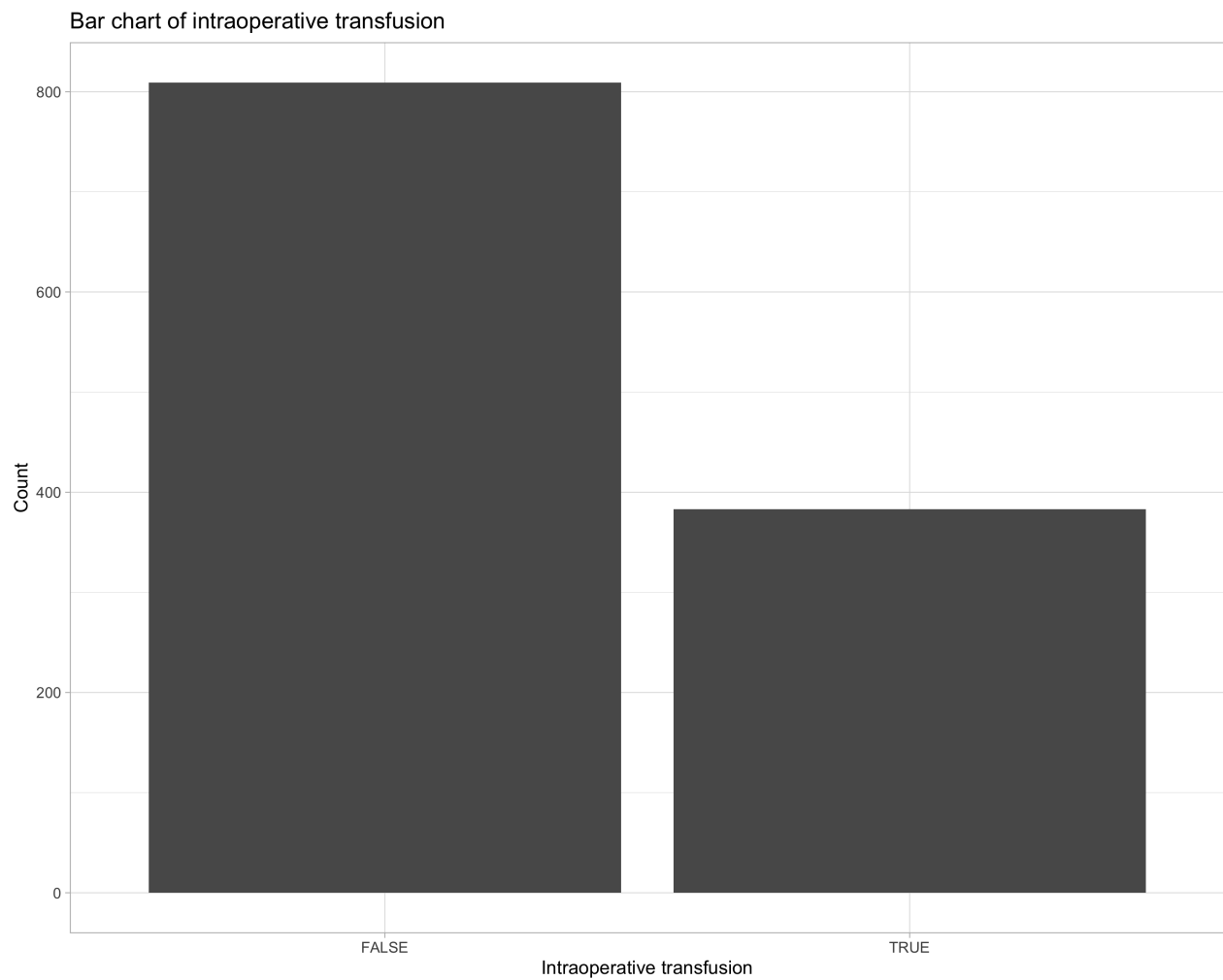
³ BV_e = Estimated blood volume

⁴ BL_r = Blood loss ratio, BL_a = Absolute blood loss

⁵Iglewicz, B., & Hoaglin, D. C. (1993). How to detect and handle outliers. Milwaukee, Wis: ASQC Quality Press.

⁶ M_i = Modified Z-score, \tilde{x} = Median of x , MAD = Median absolute deviation





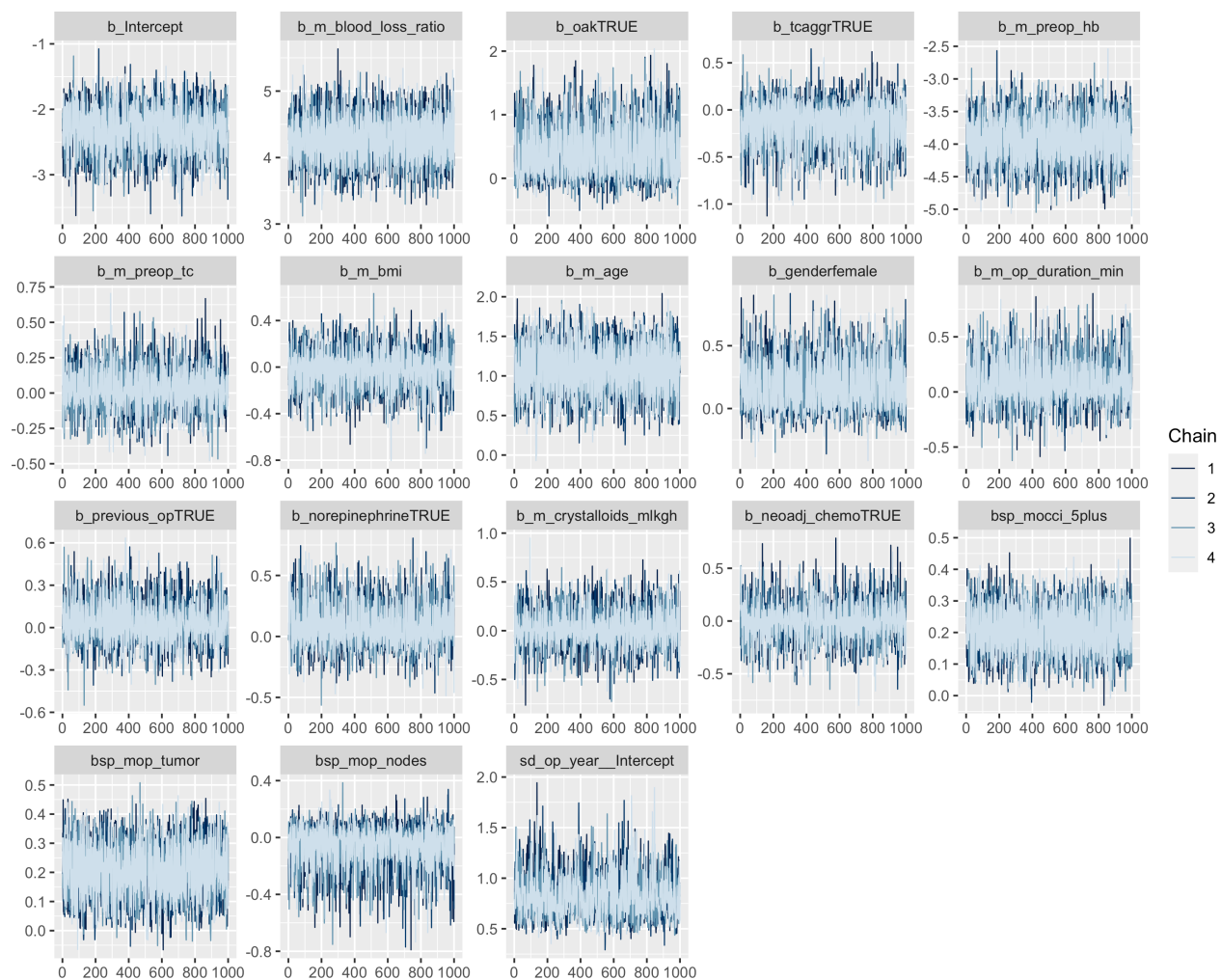
3.2 Model outputs

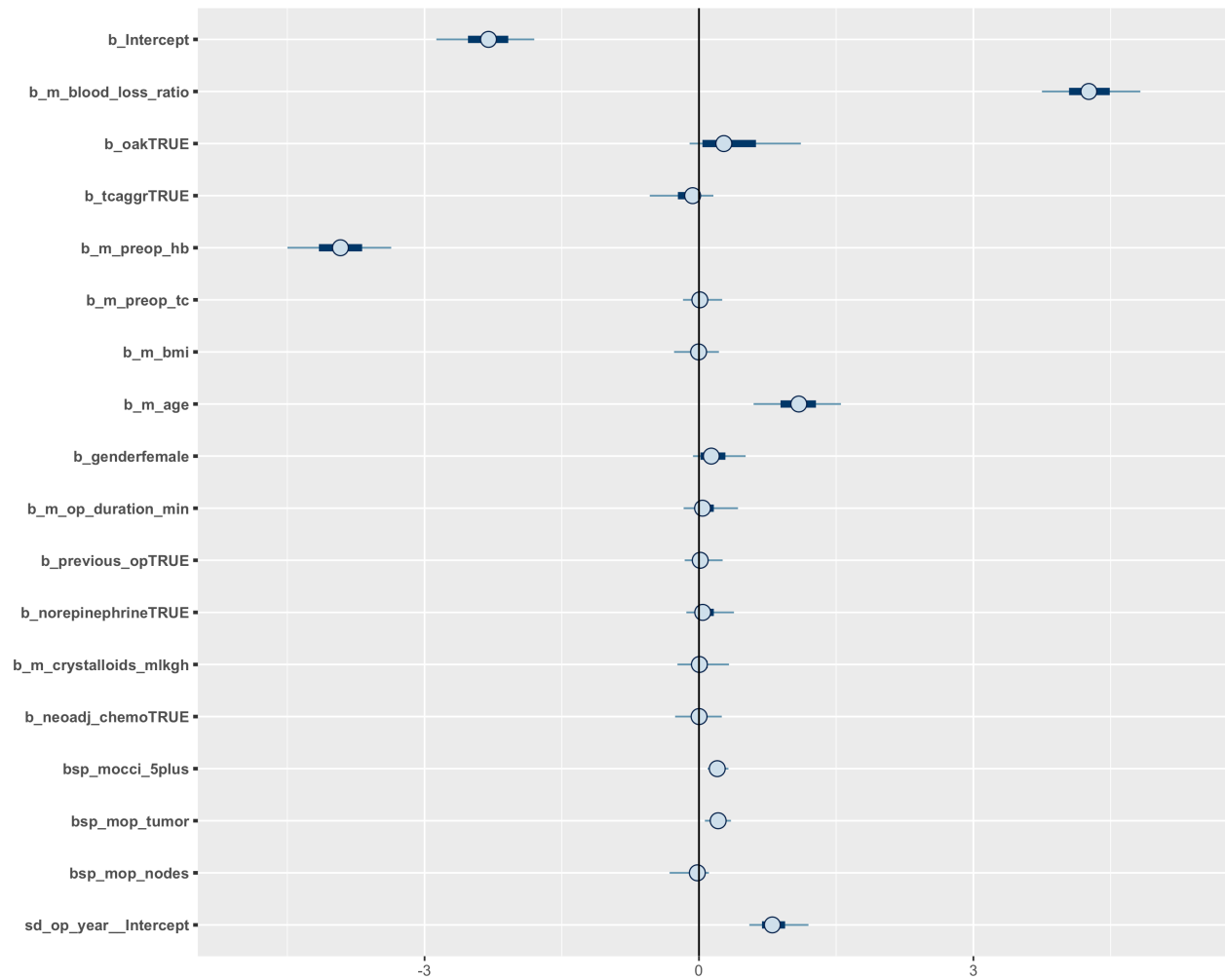
3.2.1 Models with intraoperative transfusion as response

3.2.1.1 Full model

3.2.1.1.1 Diagnostics

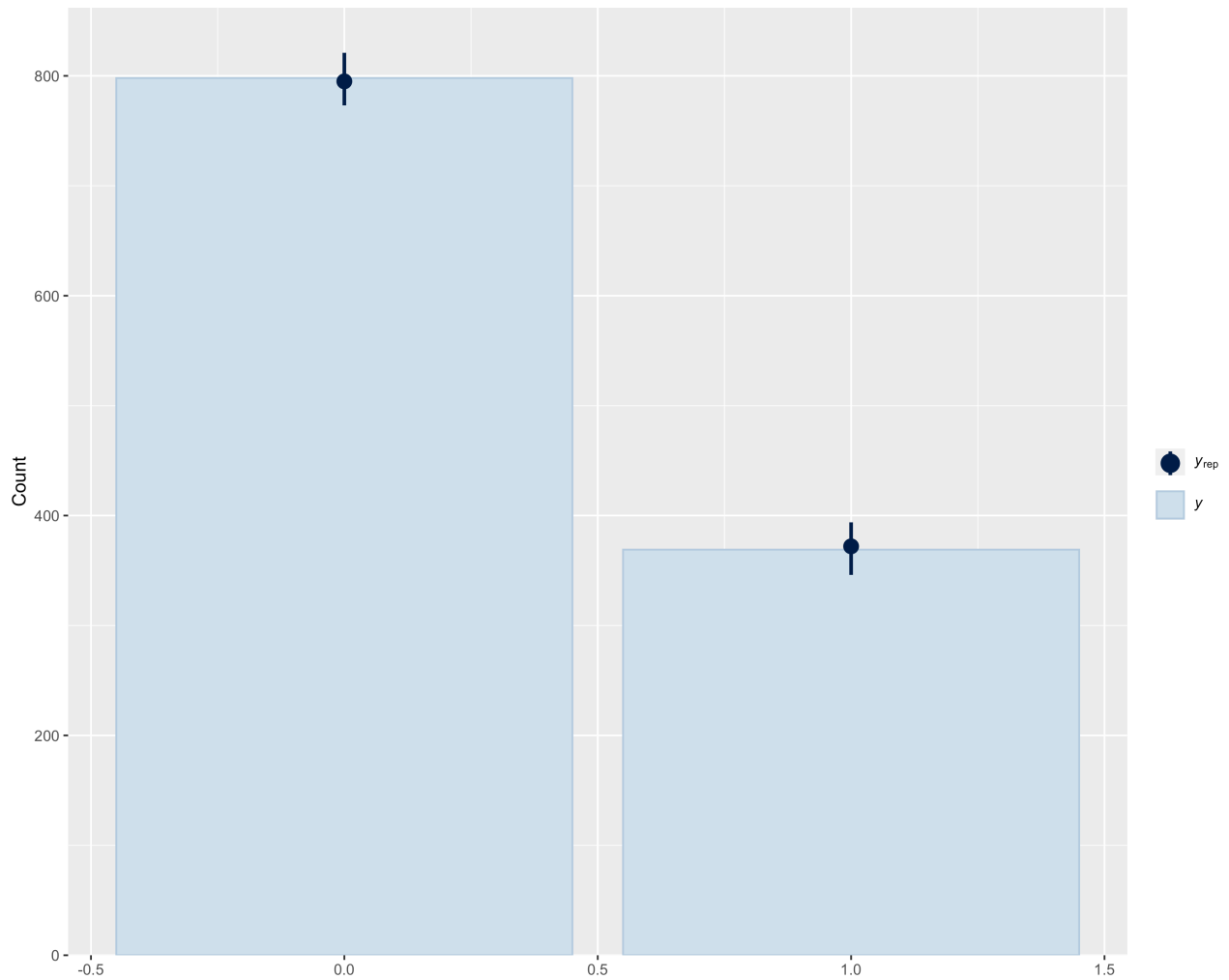
#> No divergences to plot.





3.2.1.1.2 Posterior predictive check plot

#> Using 10 posterior samples for ppc type 'bars' by default.



3.2.1.1.3 Summary

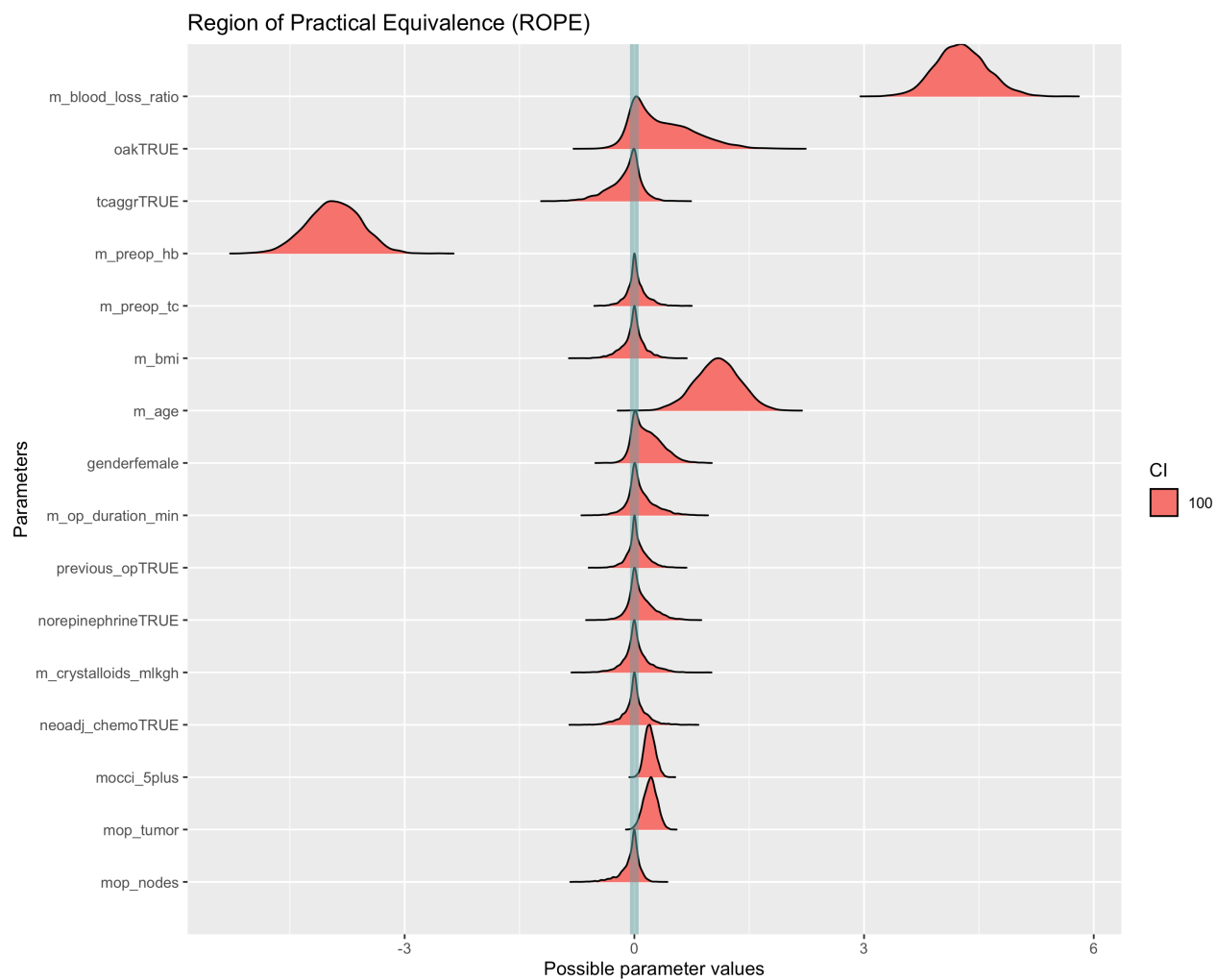
Table 1: Table continues below

	Parameter	Median	CI	CI_low	CI_high	p_MAP
2	b_Intercept	-2.301	95	-2.964	-1.682	0
4	b_m_blood_loss_ratio	4.262	95	3.655	4.956	0
12	b_oakTRUE	0.2717	95	-0.2376	1.16	0.9863
14	b_tcaggrTRUE	-0.0695	95	-0.5952	0.2448	0.9988
8	b_m_preop_hb	-3.92	95	-4.606	-3.27	0
9	b_m_preop_tc	0.009389	95	-0.2149	0.3193	0.9989
5	b_m_bmi	-0.00411	95	-0.3153	0.3057	0.9991
3	b_m_age	1.091	95	0.4793	1.619	0.004543
1	b_genderfemale	0.1346	95	-0.1196	0.5567	0.9981
7	b_m_op_duration_min	0.03895	95	-0.2598	0.4823	0.9975
13	b_previous_opTRUE	0.01358	95	-0.2212	0.3027	0.9989
11	b_norepinephrineTRUE	0.04088	95	-0.2135	0.4272	0.9999
6	b_m_crystalloids_mlkgh	0.004561	95	-0.2914	0.4215	0.999
10	b_neoadj_chemoTRUE	0.001213	95	-0.345	0.3073	0.9951
15	bsp_mocci_5plus	0.1997	95	0.06909	0.3384	0.008479
17	bsp_mop_tumor	0.2098	95	0.04473	0.382	0.07025

	Parameter	Median	CI	CI_low	CI_high	p_MAP
16	bsp_mop_nodes	-0.01791	95	-0.3621	0.1611	0.9918

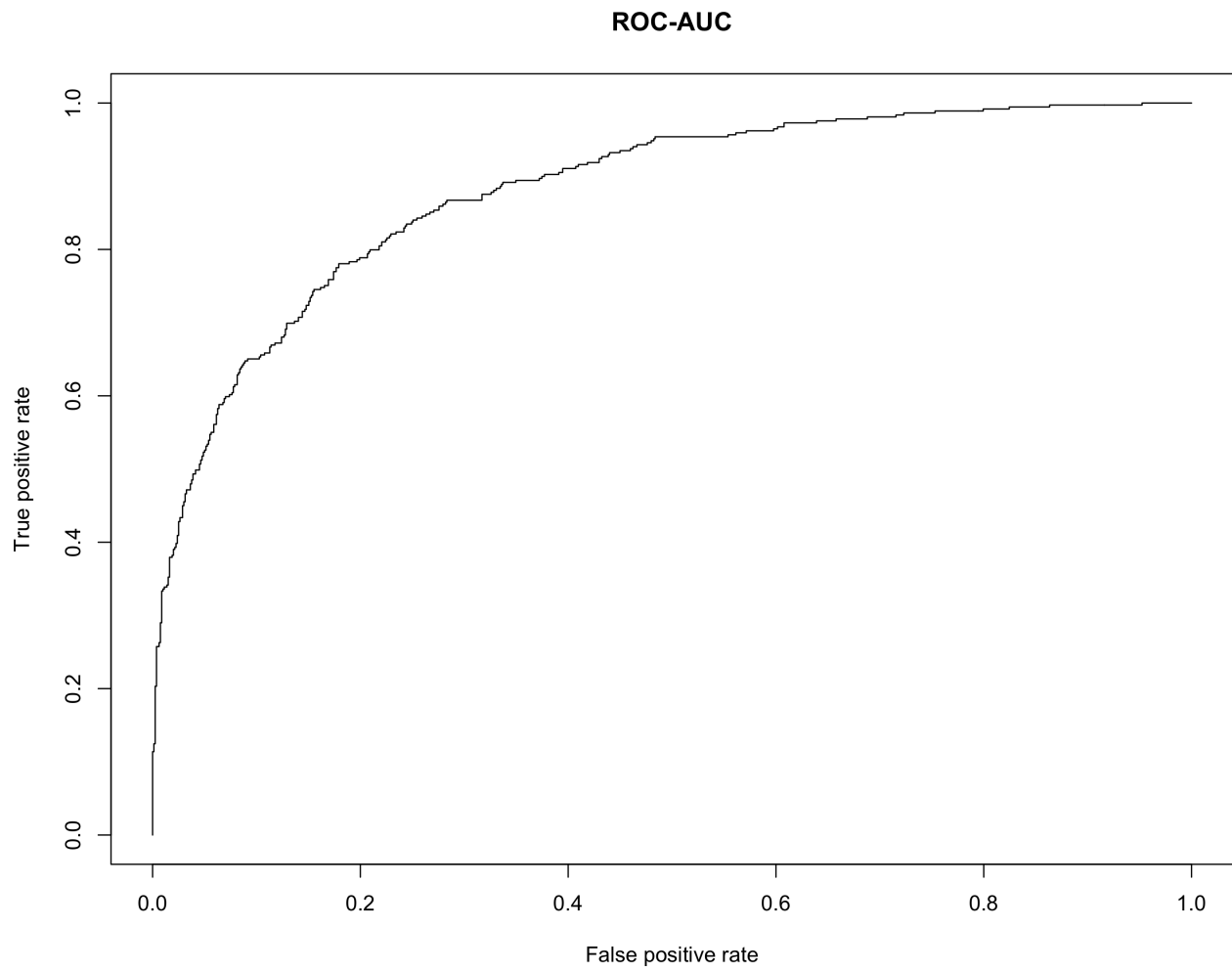
	pd	ROPE_CI	ROPE_low	ROPE_high	ROPE_Percentage
2	1	100	-0.055	0.055	0
4	1	100	-0.055	0.055	0
12	0.8315	100	-0.055	0.055	0.198
14	0.704	100	-0.055	0.055	0.318
8	1	100	-0.055	0.055	0
9	0.5643	100	-0.055	0.055	0.4695
5	0.527	100	-0.055	0.055	0.4385
3	0.9995	100	-0.055	0.055	0.00075
1	0.8127	100	-0.055	0.055	0.2865
7	0.6623	100	-0.055	0.055	0.3877
13	0.5965	100	-0.055	0.055	0.4645
11	0.6665	100	-0.055	0.055	0.3945
6	0.5317	100	-0.055	0.055	0.4113
10	0.5122	100	-0.055	0.055	0.4475
15	0.9992	100	-0.055	0.055	0.013
17	0.993	100	-0.055	0.055	0.04075
16	0.6238	100	-0.055	0.055	0.5

3.2.1.1.4 Region of practical equivalence Using a ROPE range of -0.055 to 0.055 ($0.1 \cdot \frac{\sqrt{3}}{\pi}$) and a CI of 1.



3.2.1.1.5 ROC-AUC

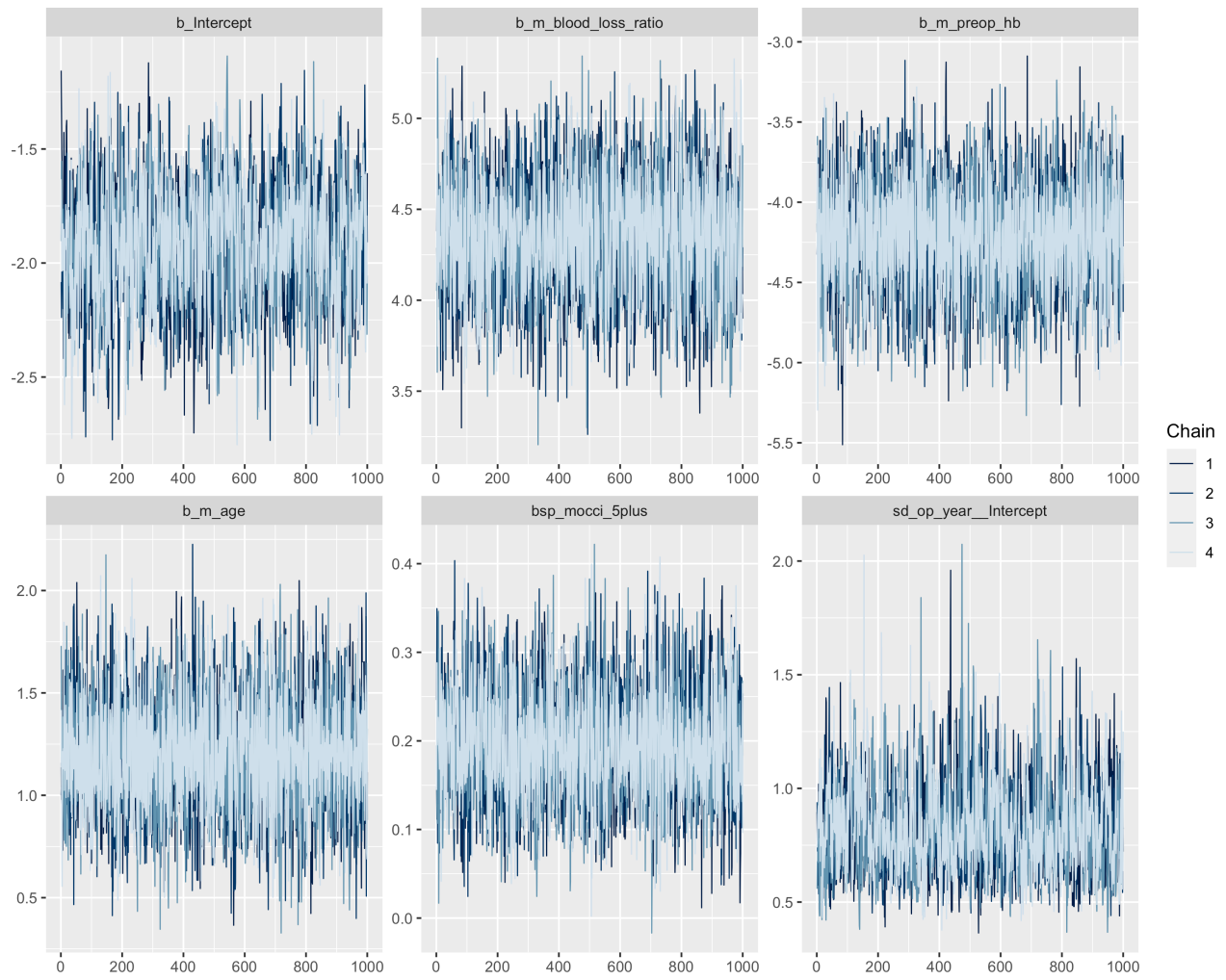
#> AUC: 0.879203428625768

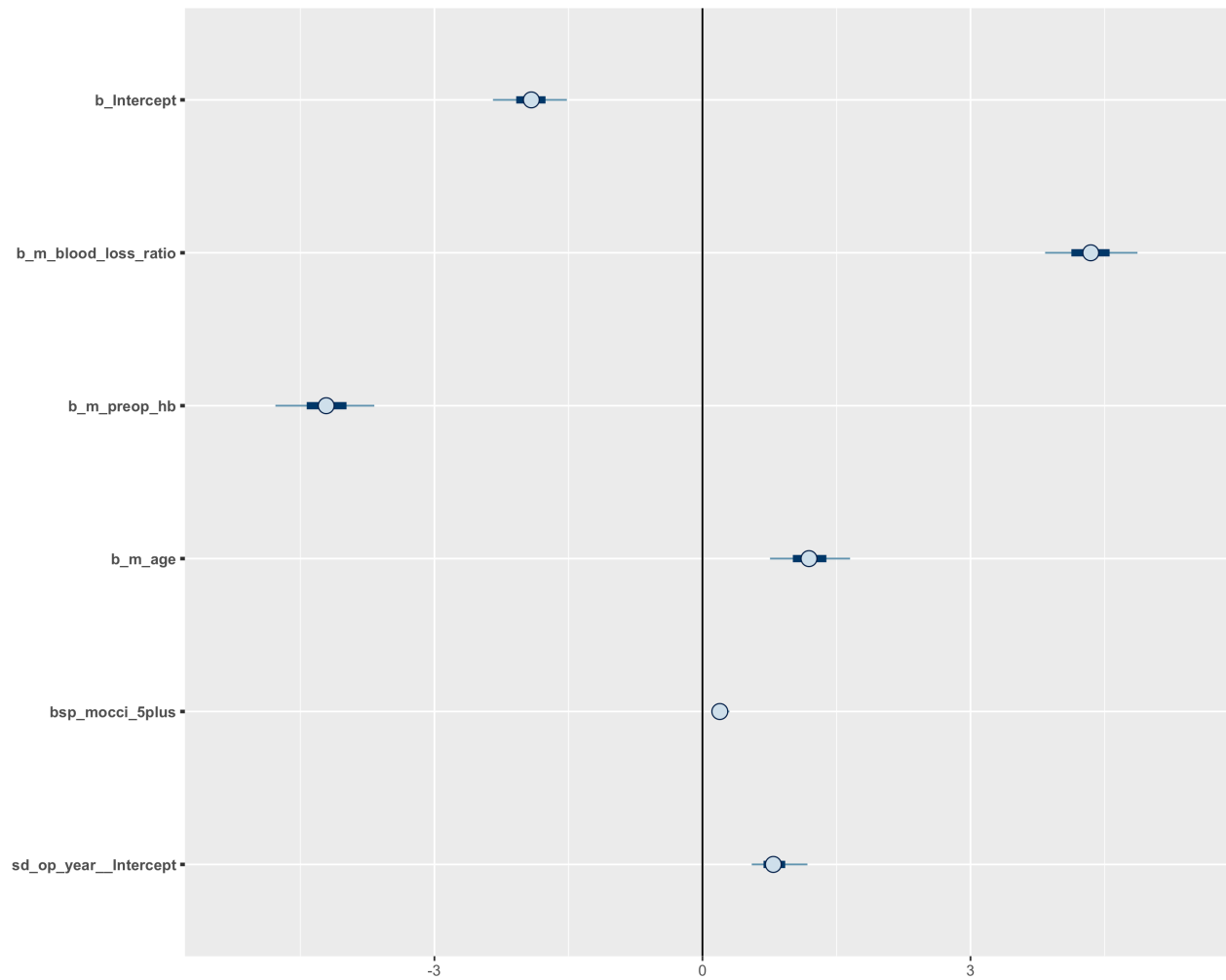


3.2.1.2 Reduced model

3.2.1.2.1 Diagnostics

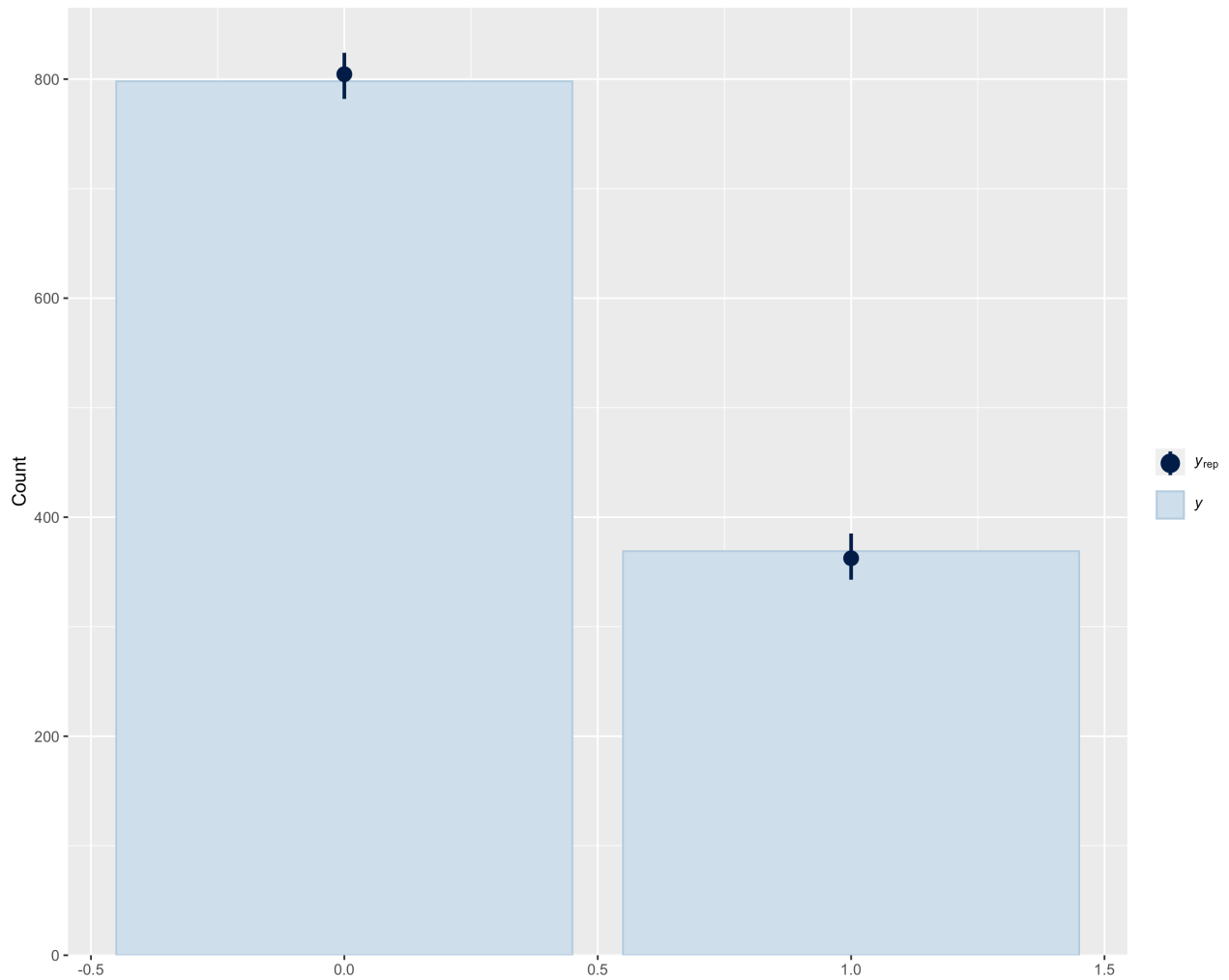
#> No divergences to plot.





3.2.1.2.2 Posterior predictive check plot

#> Using 10 posterior samples for ppc type 'bars' by default.



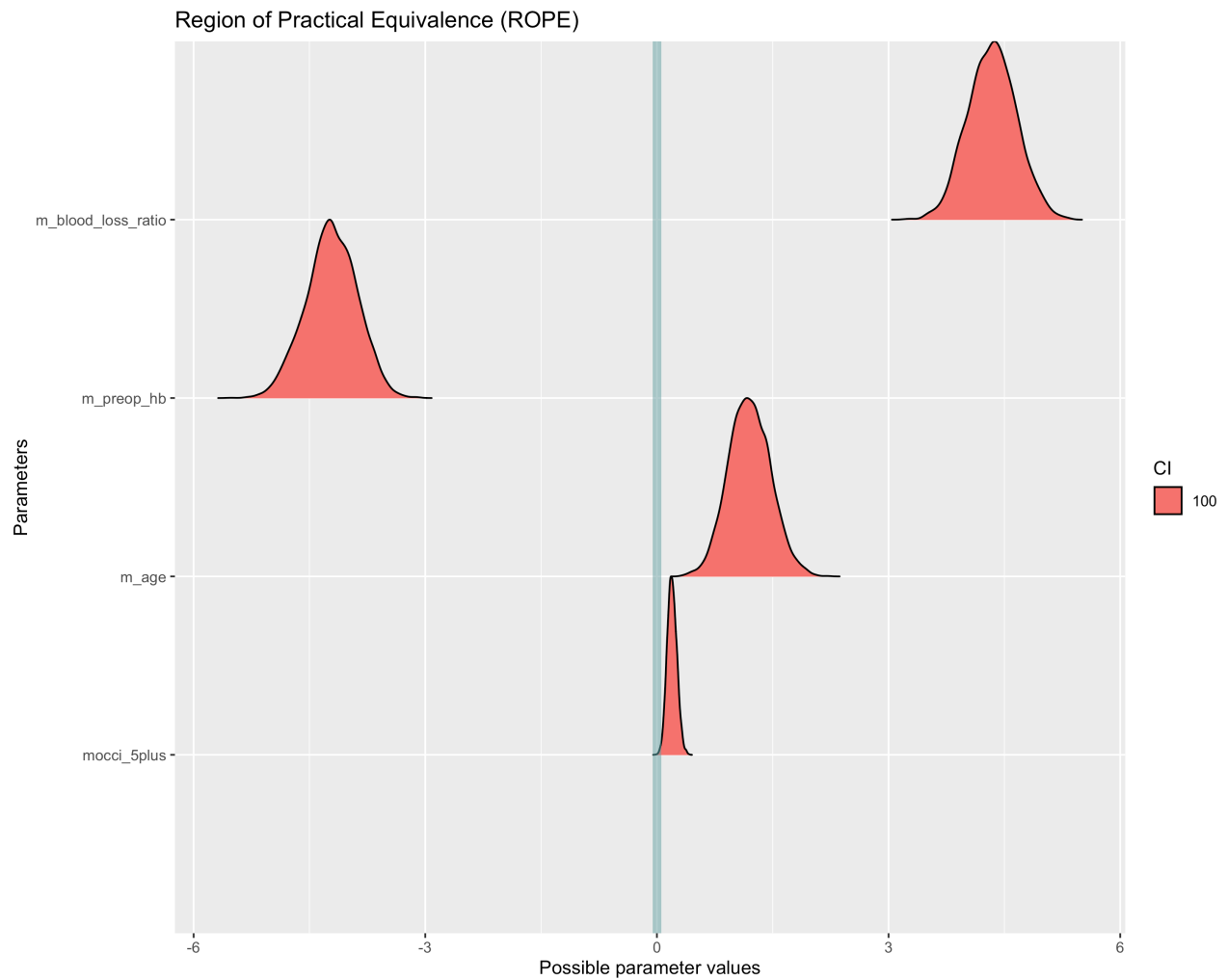
3.2.1.2.3 Summary

Table 3: Table continues below

	Parameter	Median	CI	CI_low	CI_high	p_MAP
1	b_Intercept	-1.916	95	-2.407	-1.425	0
3	b_m_blood_loss_ratio	4.346	95	3.738	4.964	0
4	b_m_preop_hb	-4.211	95	-4.859	-3.567	0
2	b_m_age	1.192	95	0.6562	1.711	0
5	bsp_mocci_5plus	0.1941	95	0.08309	0.3244	0.004427

	pd	ROPE_CI	ROPE_low	ROPE_high	ROPE_Percentage
1	1	100	-0.055	0.055	0
3	1	100	-0.055	0.055	0
4	1	100	-0.055	0.055	0
2	1	100	-0.055	0.055	0
5	0.9998	100	-0.055	0.055	0.0095

3.2.1.2.4 Region of practical equivalence Using a ROPE range of -0.055 to 0.055 ($0.1 \cdot \frac{\sqrt{3}}{\pi}$) and a CI of 1.



3.2.1.2.5 ROC-AUC

#> AUC: 0.873518484558283

ROC-AUC

