R Notebook for the cystectomy study

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22nd May 2020

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## Loading required package: pacman
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1 Index

Welcome to the notebook!

2 Prerequisites

2.1 Formulas

- Indexed blood volume[1]: $BV_i = \frac{70}{\sqrt{\frac{BMI}{22}}}$[2]
- Estimated blood volume: $BV_e = BV_i \cdot Weight$[3]
- Blood loss ratio: $BL_r = \frac{BV_e}{BL_a}$[4]
- Standardization method for age and bmi[5]: $M_i = \frac{0.6745(x_i - \tilde{(x)})}{2 \cdot MAD}$[6]

[1] Lemmens, 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

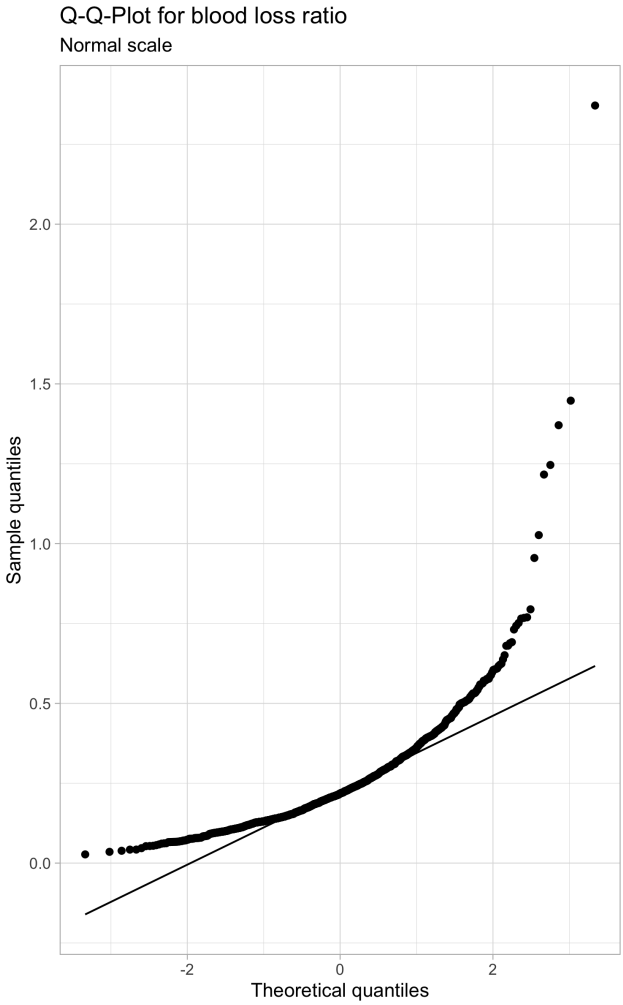
[4] BL_r = Blood loss ratio, BL_a = Absolute blood loss

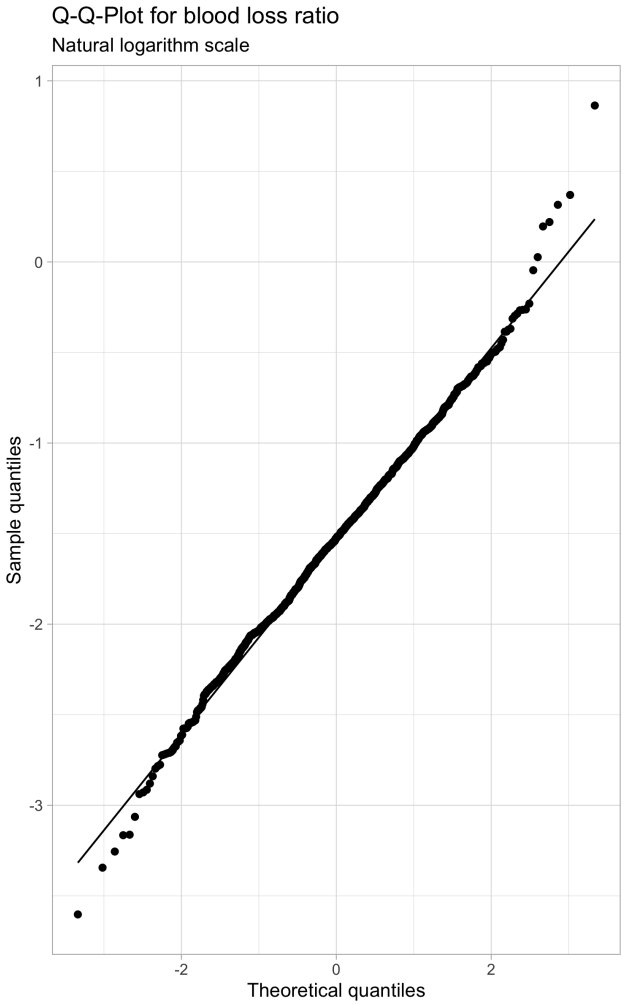
[5] Iglewicz, B., & Hoaglin, D. C. (1993). How to detect and handle outliers. Milwaukee, Wis: ASQC Quality Press.

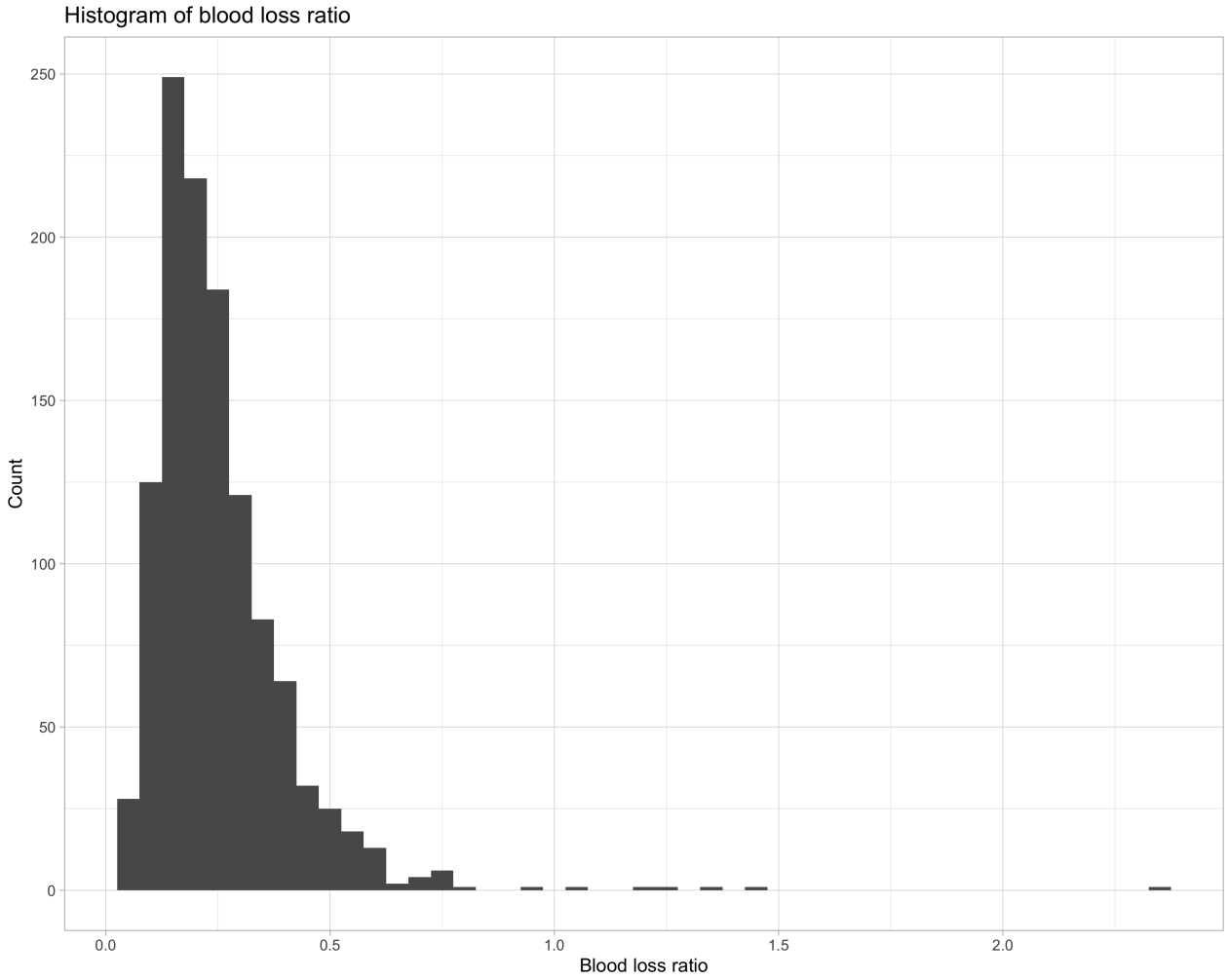
[6] M_i = Modified Z-score, $\tilde{(x)}$ = Median of x, MAD = Median absolute deviation

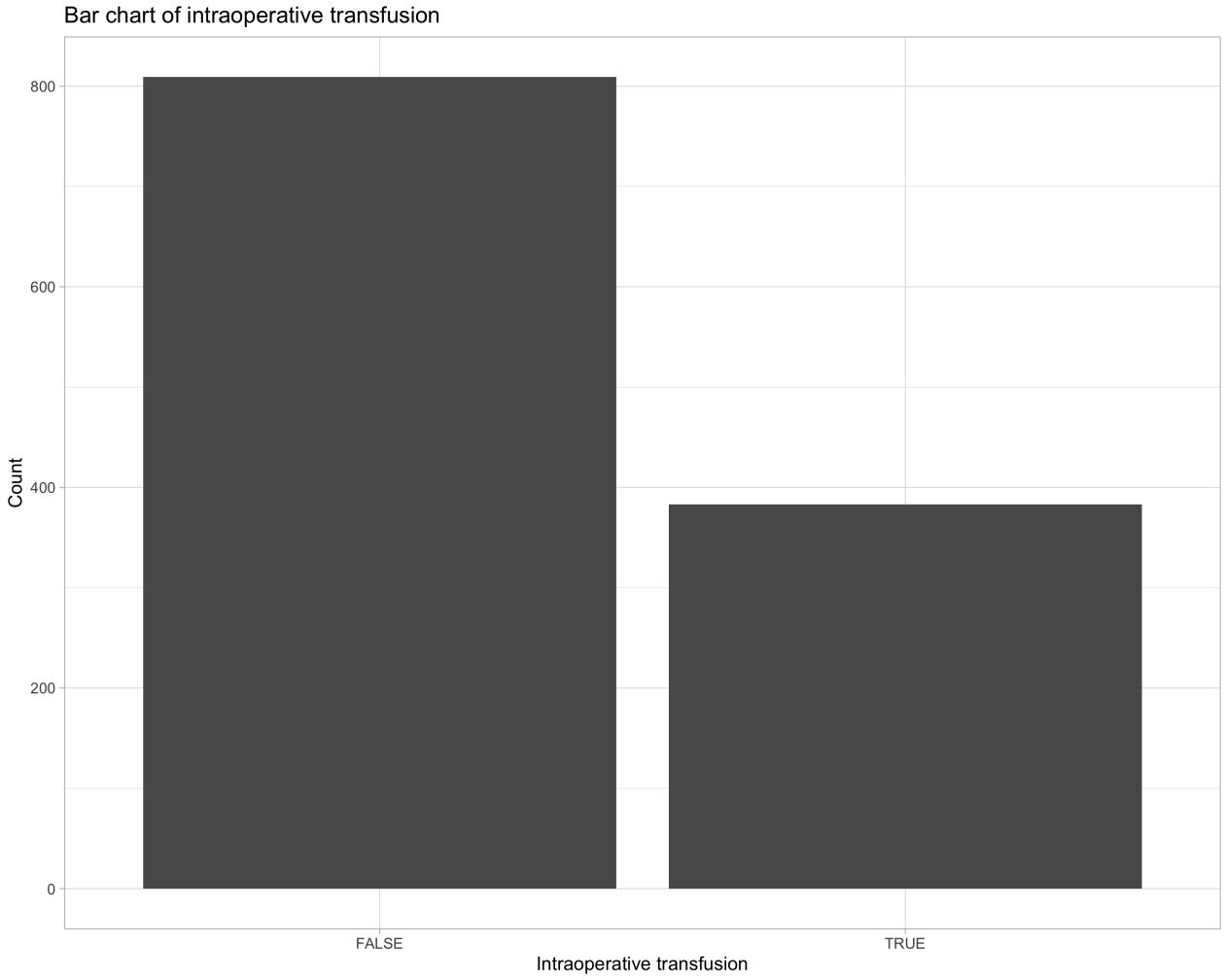
3 Results

3.1 Data plots






Histogram of blood loss ratio
Count
250
200
150
100
50
0
0.0
0.5
1.0
1.5
2.0
Blood loss ratio



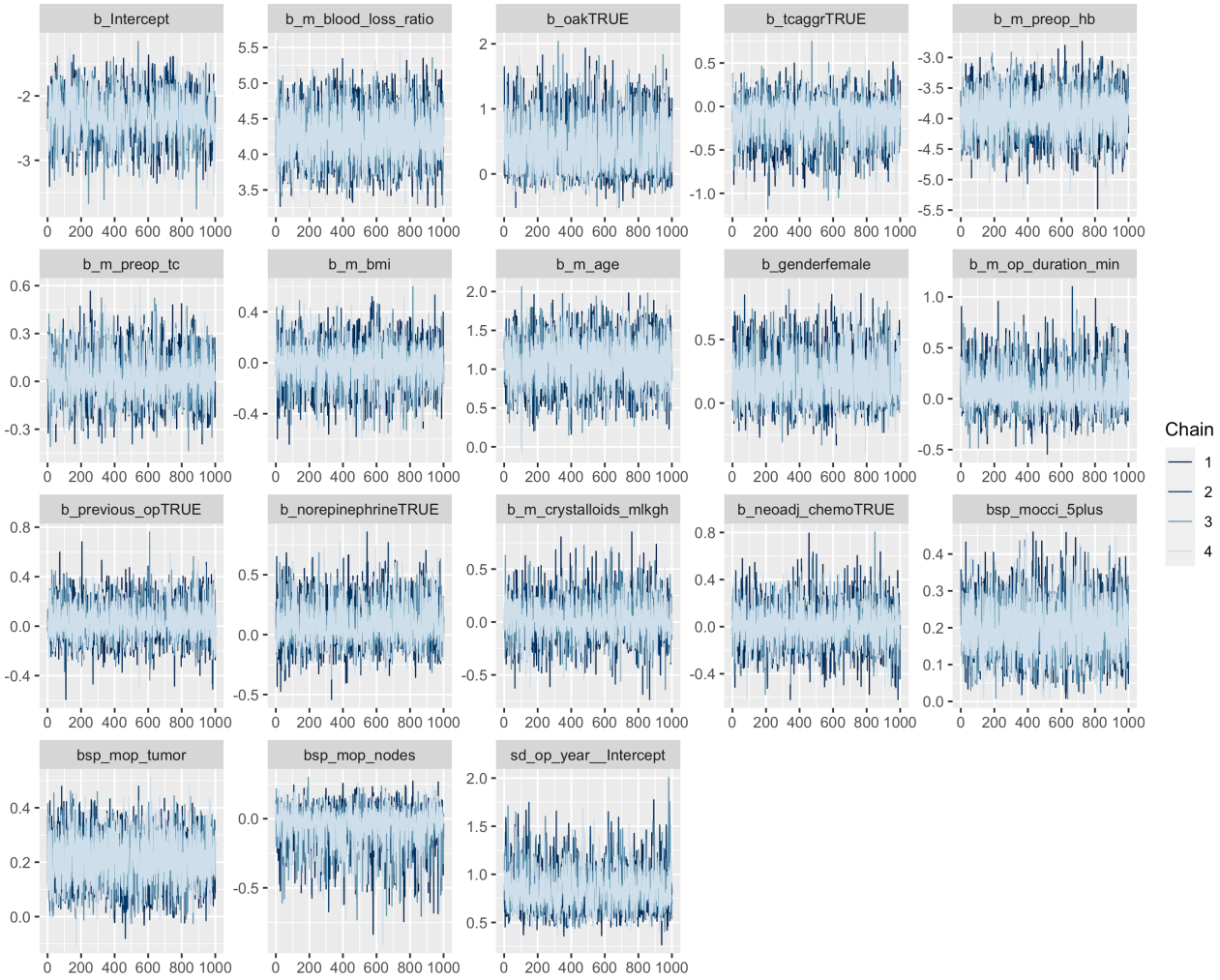
3.2 Model outputs

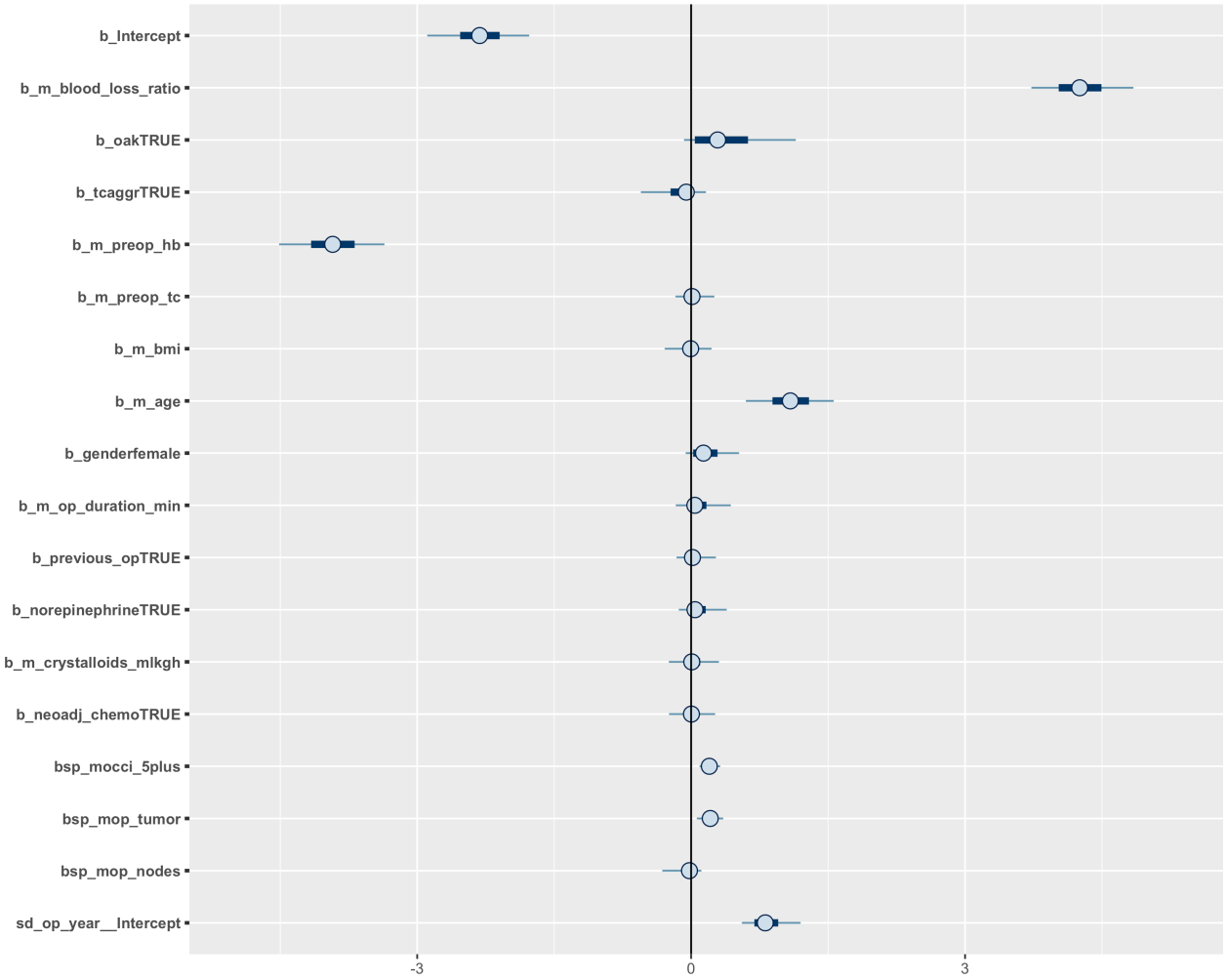
3.2.1 Models with intraoperative transfusion as response

3.2.1.1 Full model

3.2.1.1.1 Diagnostics

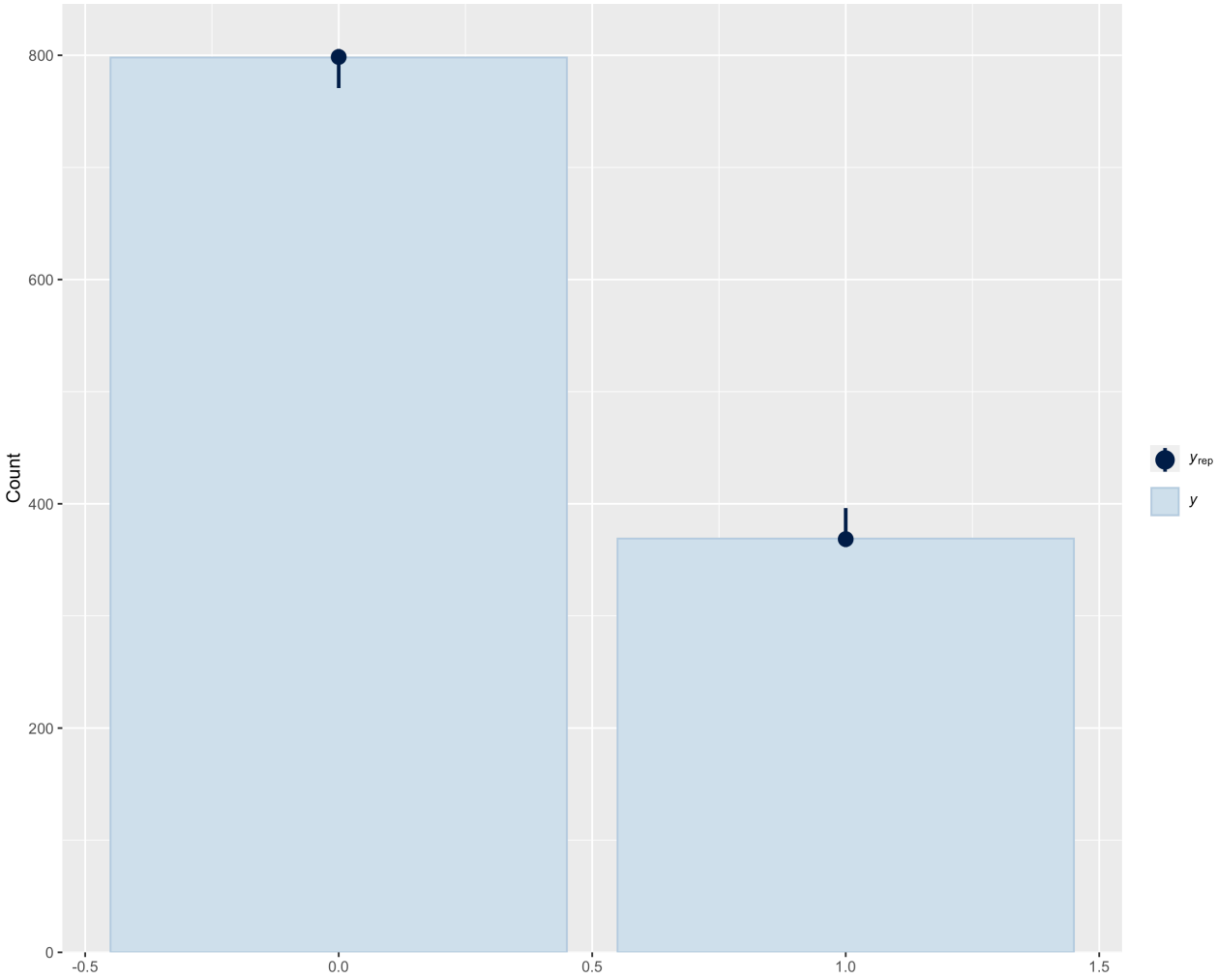
```
#> No divergences to plot.
```


b_Intercept
b_m_blood_loss_ratio
b_oakTRUE
b_tcaggrTRUE
b_m_preop_hb
b_m_preop_tc
b_m_bmi
b_m_age
b_genderfemale
b_m_op_duration_min
b_previous_opTRUE
b_norepinephrineTRUE
b_m_crystalloids_mlkgh
b_neoadj_chemoTRUE
bsp_mocci_5plus
bsp_mop_tumor
bsp_mop_nodes
sd_op_year__Intercept
Chain
1
2
3
4



3.2.1.1.2 Posterior predictive check plot

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



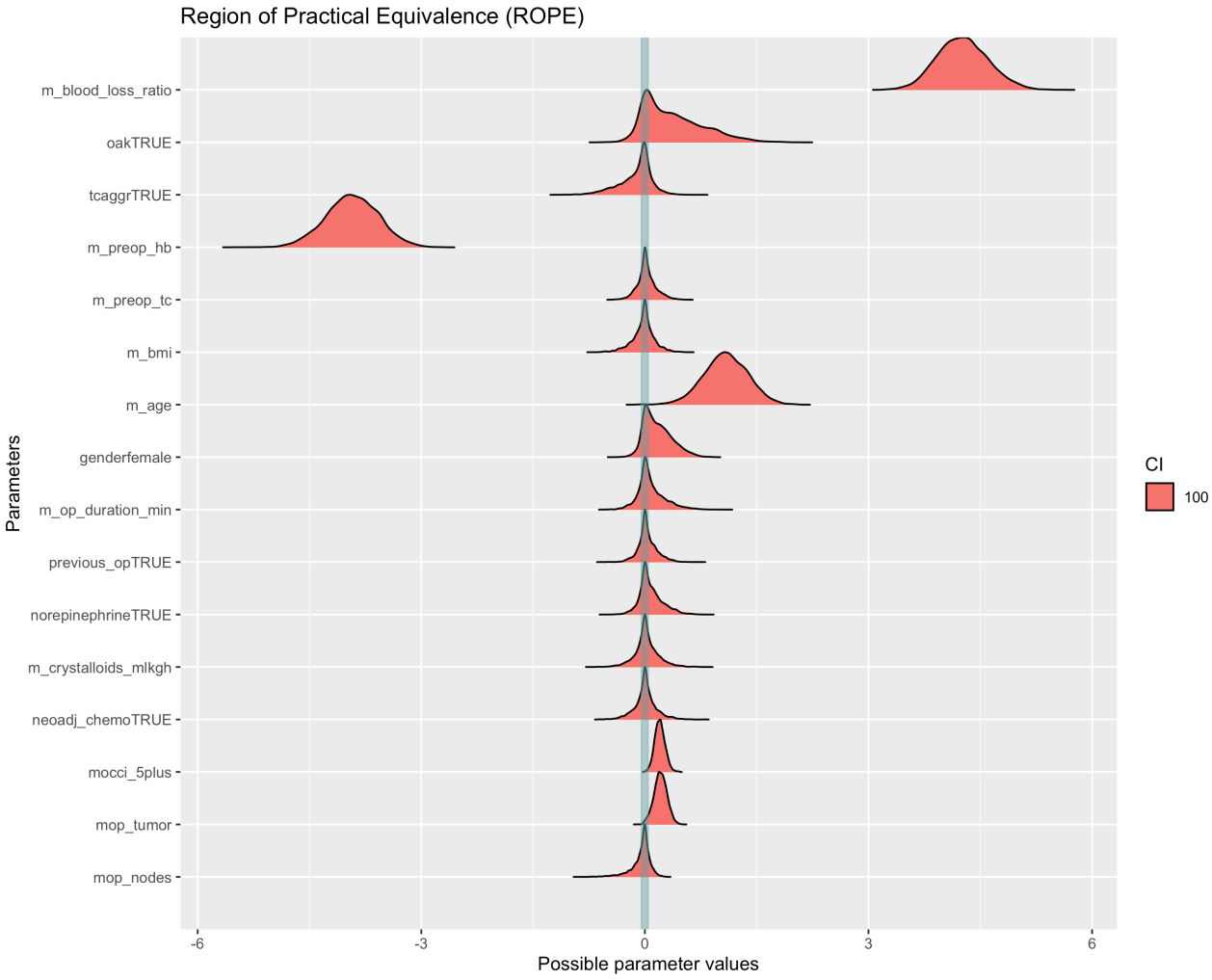
3.2.1.1.3 Summary

```
#> # Description of Posterior Distributions
#>
#> Parameter            | Median |           95% CI | p_MAP |    pd |       100% ROPE | % in ROPE
#> ------------------------------------------------------------------------------------------------
#> Intercept            | -2.316 | [-2.976, -1.652] | 0.000 | 1.000 | [-0.055, 0.055] |     0.000
#> m_blood_loss_ratio   |  4.256 | [ 3.619,  4.937] | 0.000 | 1.000 | [-0.055, 0.055] |     0.000
#> oakTRUE              |  0.290 | [-0.207,  1.212] | 0.987 | 0.845 | [-0.055, 0.055] |    20.600
#> tcaggrTRUE           | -0.053 | [-0.605,  0.275] | 0.997 | 0.691 | [-0.055, 0.055] |    35.425
#> m_preop_hb           | -3.926 | [-4.657, -3.283] | 0.000 | 1.000 | [-0.055, 0.055] |     0.000
#> m_preop_tc           |  0.009 | [-0.218,  0.304] | 1.000 | 0.567 | [-0.055, 0.055] |    46.200
#> m_bmi                | -0.006 | [-0.360,  0.274] | 0.997 | 0.539 | [-0.055, 0.055] |    42.175
#> m_age                |  1.086 | [ 0.536,  1.689] | 0.007 | 0.999 | [-0.055, 0.055] |     0.125
#> genderfemale         |  0.135 | [-0.124,  0.574] | 0.988 | 0.824 | [-0.055, 0.055] |    27.950
#> m_op_duration_min    |  0.040 | [-0.266,  0.486] | 0.999 | 0.655 | [-0.055, 0.055] |    37.625
#> previous_opTRUE      |  0.015 | [-0.223,  0.310] | 0.999 | 0.590 | [-0.055, 0.055] |    46.550
#> norepinephrineTRUE   |  0.042 | [-0.201,  0.433] | 0.999 | 0.674 | [-0.055, 0.055] |    38.925
#> m_crystalloids_mlkgh |  0.007 | [-0.325,  0.370] | 1.000 | 0.546 | [-0.055, 0.055] |    40.975
#> neoadj_chemoTRUE     |  0.003 | [-0.326,  0.322] | 0.996 | 0.525 | [-0.055, 0.055] |    43.350
#> mocci_5plus          |  0.199 | [ 0.068,  0.338] | 0.000 | 1.000 | [-0.055, 0.055] |     1.550
#> mop_tumor            |  0.209 | [ 0.032,  0.374] | 0.085 | 0.991 | [-0.055, 0.055] |     4.225
```

```
#> mop_nodes             | -0.018 | [-0.361,  0.166] | 1.000 | 0.616 | [-0.055, 0.055] |    51.125
```

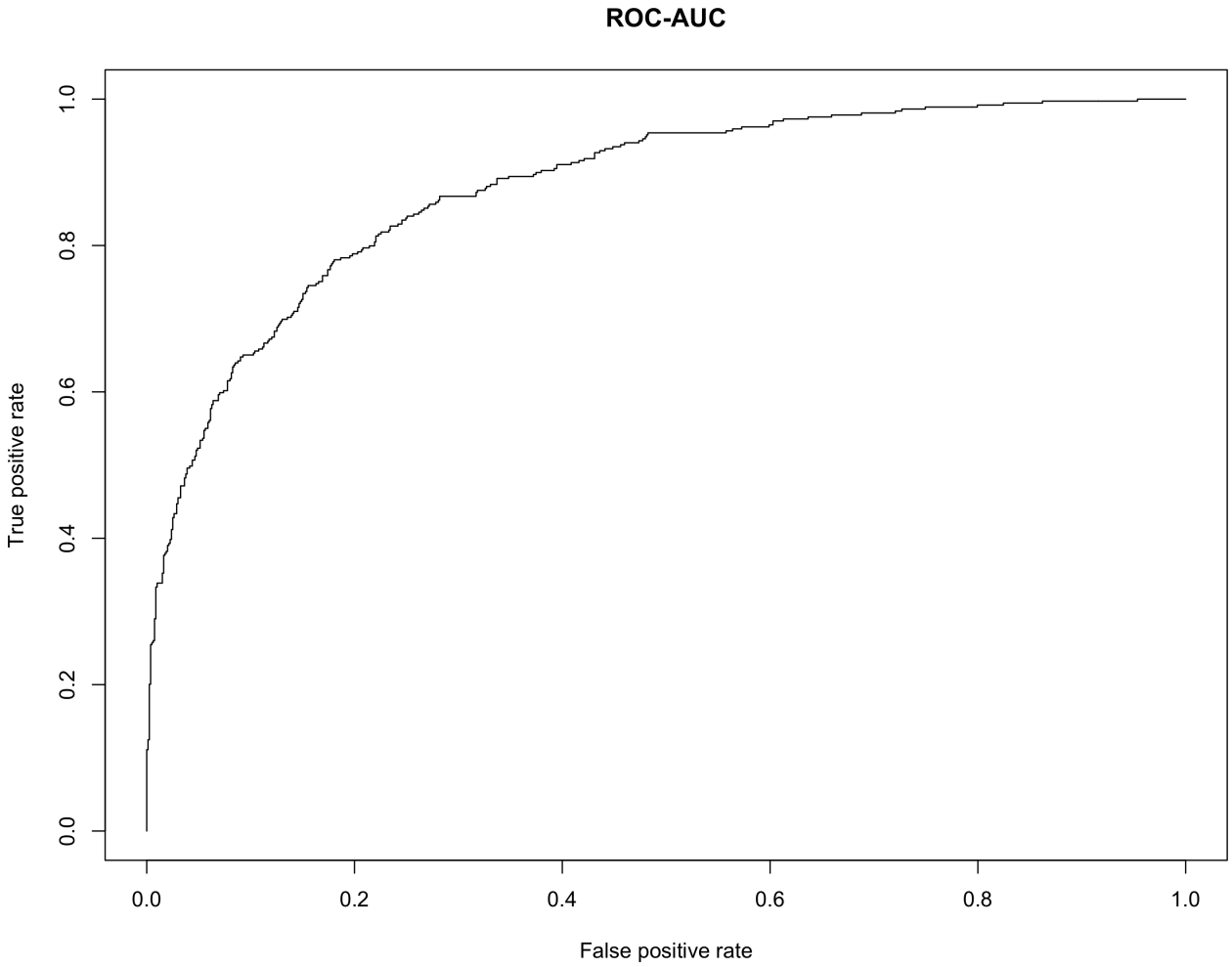
3.2.1.1.4 Region of practical equivalence

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: 0.879159280314611
```

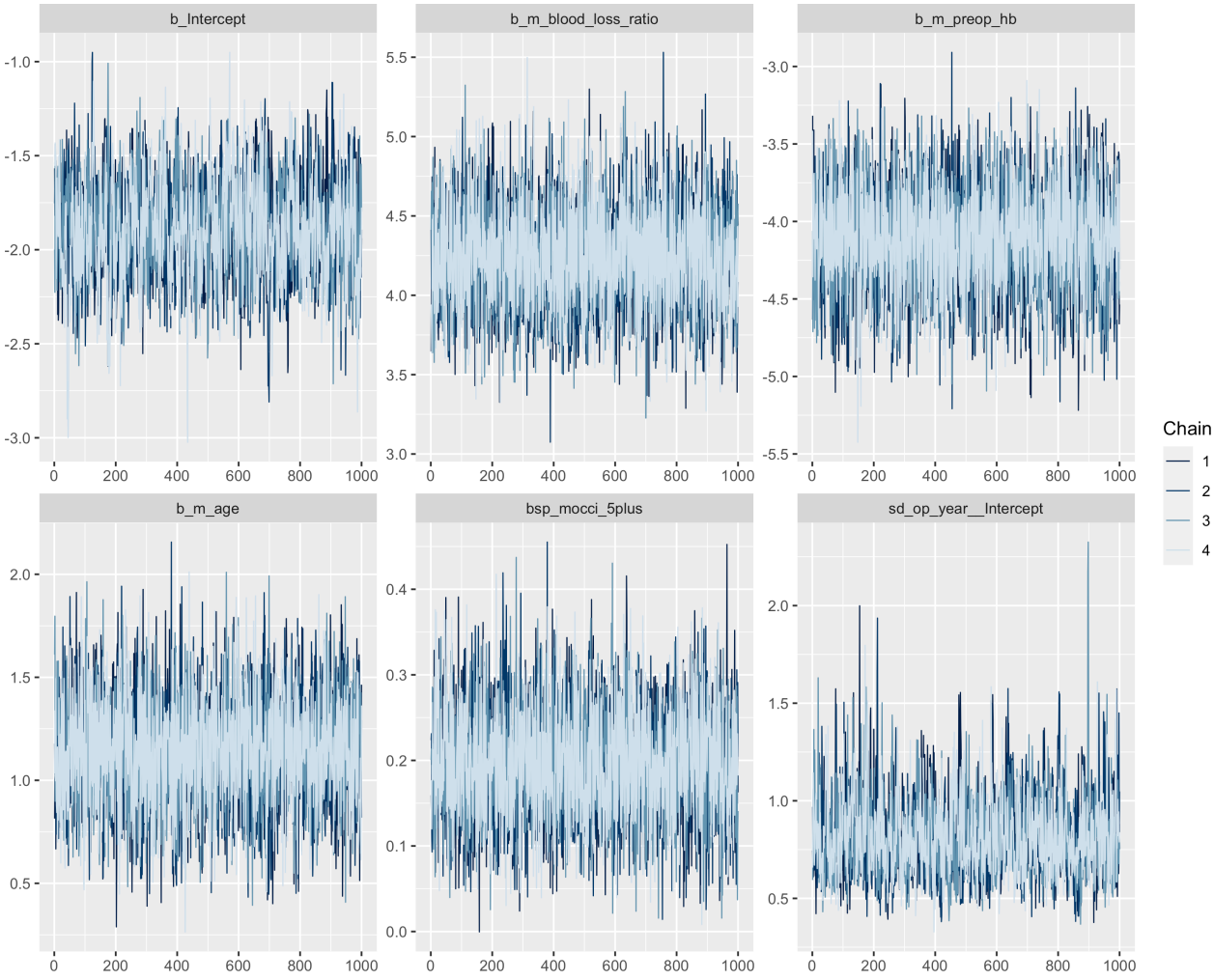


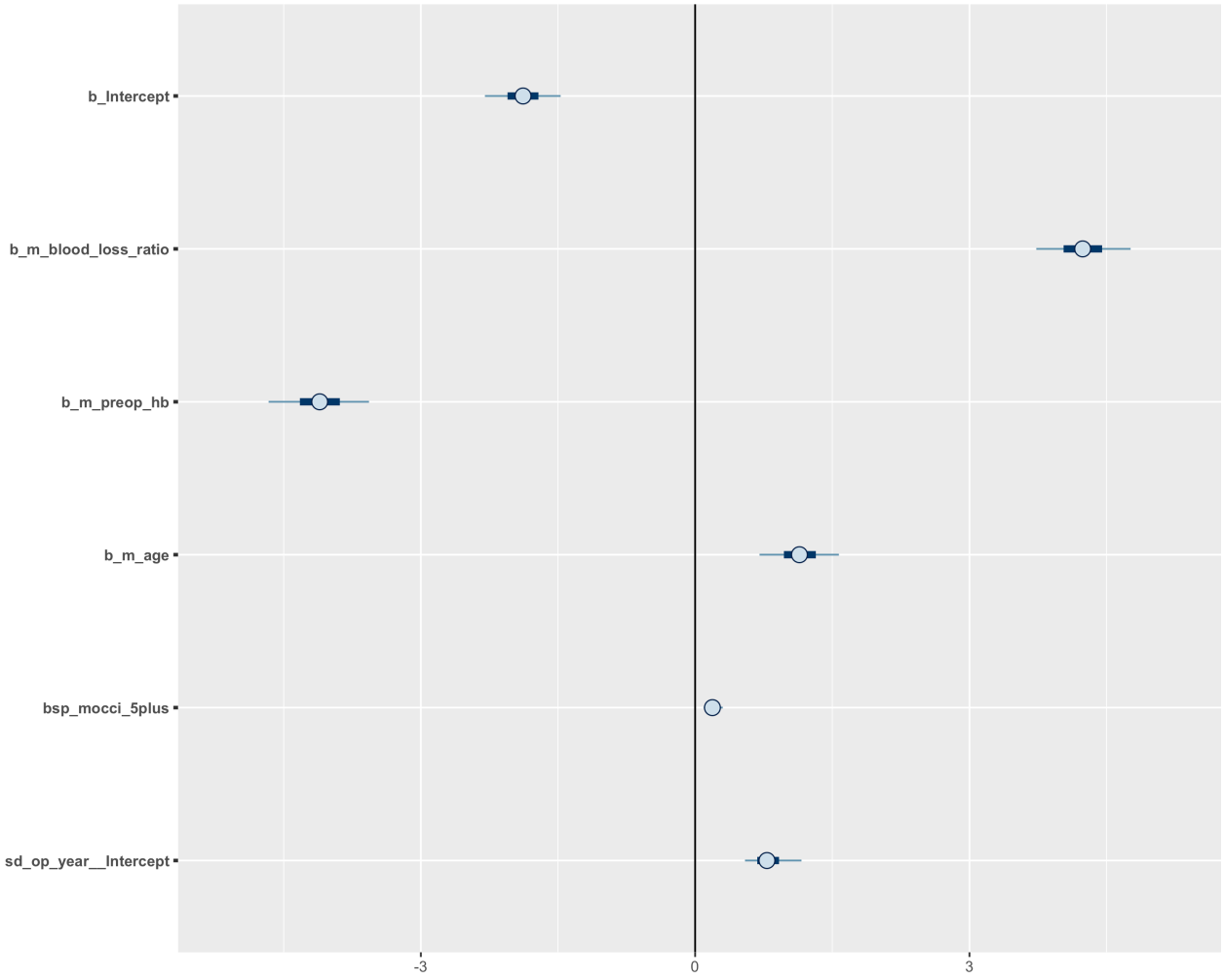
3.2.1.1.6 Conditional probability plot

3.2.1.2 Reduced model

3.2.1.2.1 Diagnostics

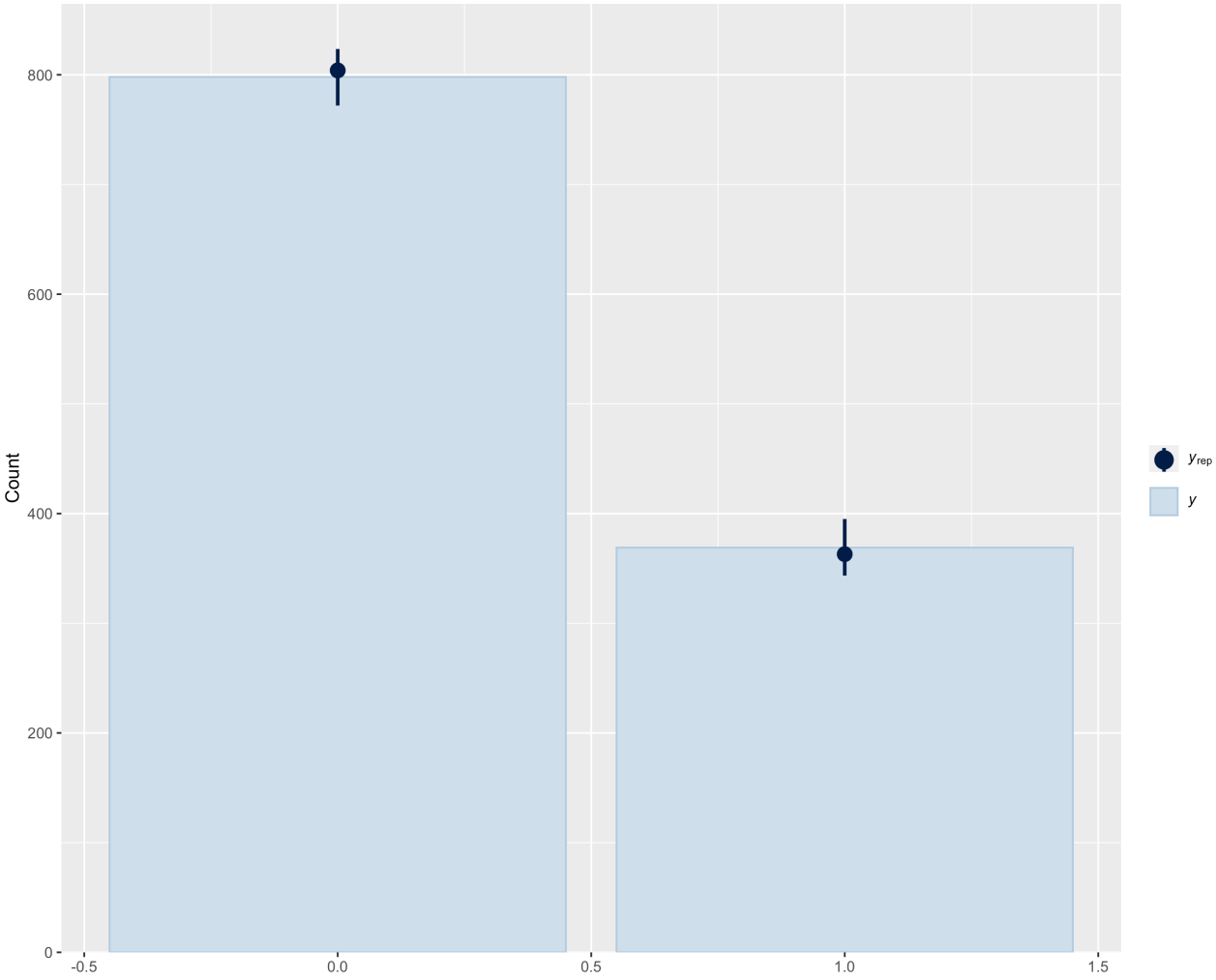
```
#> No divergences to plot.
```


b_Intercept
b_m_blood_loss_ratio
b_m_preop_hb
b_m_age
bsp_mocci_5plus
sd_op_year__Intercept
Chain
1
2
3
4



3.2.1.2.2 Posterior predictive check plot

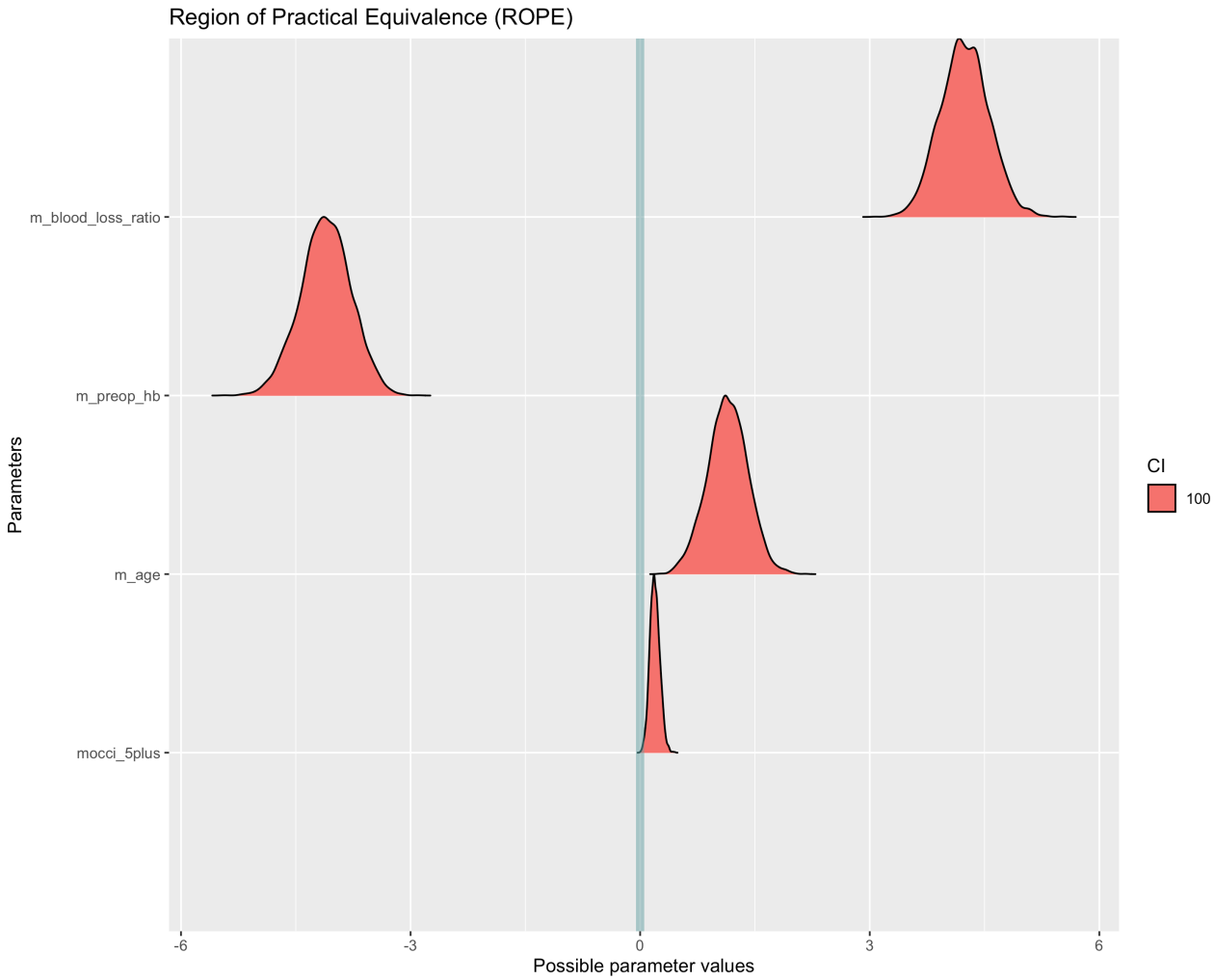
```
#> Using 10 posterior samples for ppc type 'bars' by default.
```



3.2.1.2.3 Summary

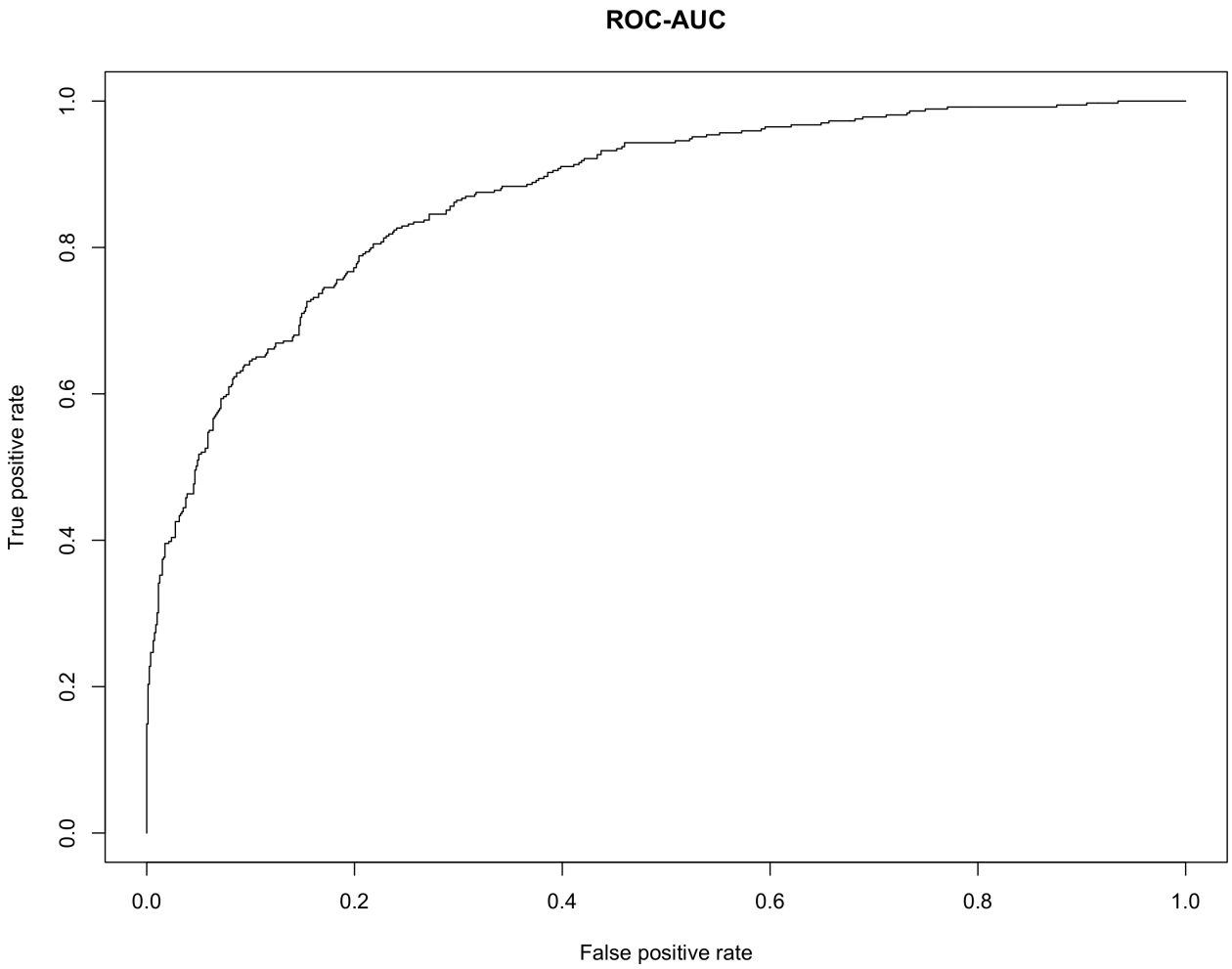
```
#> # Description of Posterior Distributions
#>
#> Parameter          | Median |           95% CI | p_MAP |    pd |       100% ROPE | % in ROPE
#> ------------------------------------------------------------------------------------------
#> Intercept          | -1.882 | [-2.380, -1.392] | 0.000 | 1.000 | [-0.055, 0.055] |     0.000
#> m_blood_loss_ratio |  4.238 | [ 3.631,  4.851] | 0.000 | 1.000 | [-0.055, 0.055] |     0.000
#> m_preop_hb         | -4.106 | [-4.753, -3.466] | 0.000 | 1.000 | [-0.055, 0.055] |     0.000
#> m_age              |  1.141 | [ 0.615,  1.642] | 0.000 | 1.000 | [-0.055, 0.055] |     0.000
#> mocci_5plus        |  0.189 | [ 0.062,  0.312] | 0.006 | 1.000 | [-0.055, 0.055] |     1.250
```

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: 0.873386039624811
```



3.2.1.2.6 Conditional probability plot