

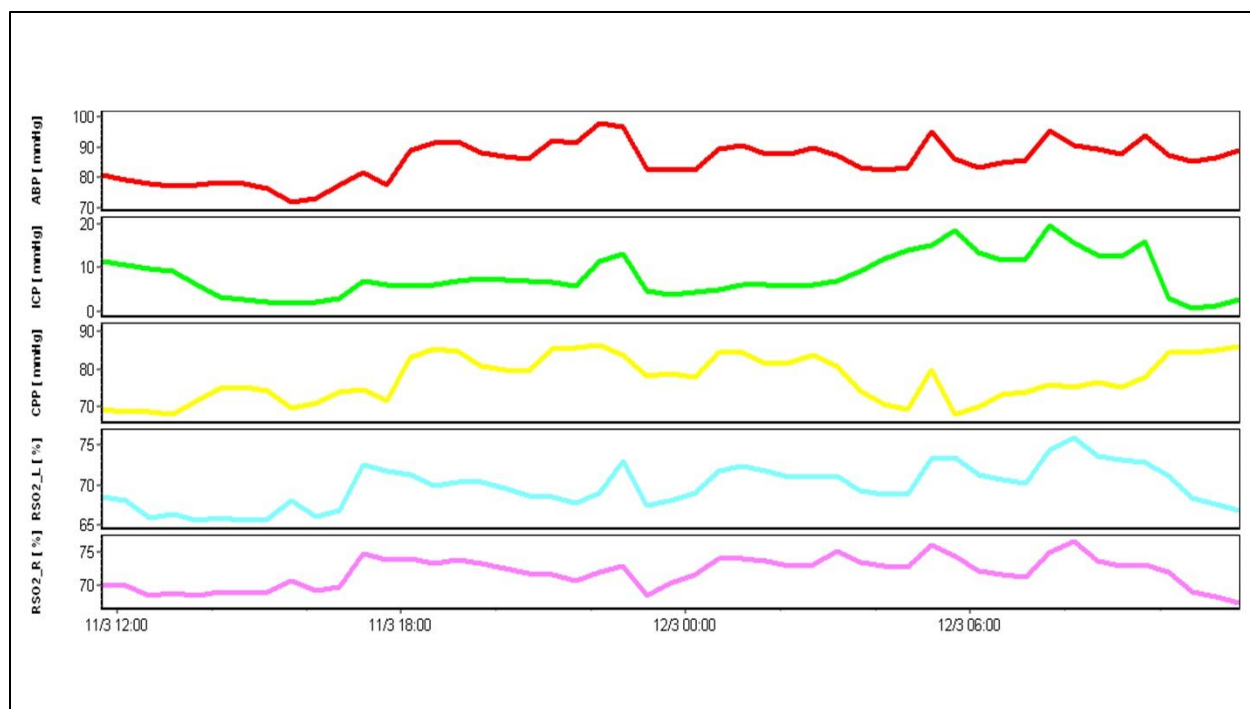
### Supplementary Material

**Table S1:** Presented are the Akaike Information Criterion (AIC), Bayesian Information Criterion, and Log Likelihood (LL) for the various linear mixed effects models of the pressure reactivity index (PRx) modeled from the cerebral perfusion pressure based cerebral oxygen index (COx). For each model, the autoregressive (AR) and moving average (MA) order of the correction for autocorrelated residuals was varied from 0 to 4. The top four performing models by each criterion are in bold.

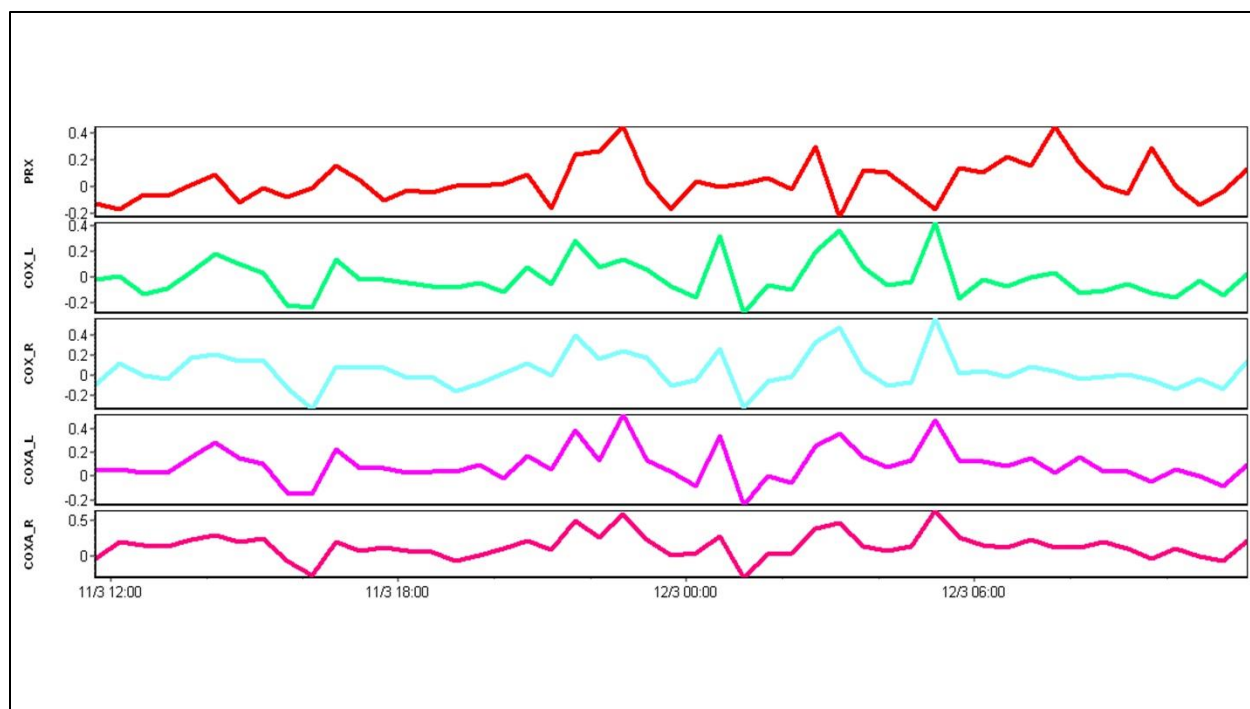
<u>AR Order</u>	<u>MA Order</u>	<u>AIC</u>	<u>BIC</u>	<u>LL</u>
0	0	-1564.486	-1521.796	788.2428
0	1	-3674.154	-3624.349	1844.077
0	2	-4349.61	-4292.69	2182.805
0	3	-4704.492	-4640.458	2361.246
0	4	-4922.298	-4851.148	2471.149
1	0	-4869.732	-4819.928	2441.866
1	1	-5502.863	-5445.943	2759.431
1	2	-5606.317	-5542.282	2812.158
1	3	-5619.35	-5548.2	2819.675
1	4	-5451.408	-5373.144	2736.704
2	0	-5233.401	-5176.482	2624.701
2	1	-5623.885	<b>-5559.851</b>	2820.942
2	2	<b>-5632.101</b>	<b>-5560.952</b>	2826.05
2	3	-5610.333	-5532.068	2816.166
2	4	-5620.928	-5535.549	2822.464
3	0	-5403.569	-5339.534	2710.784
3	1	-5628.959	<b>-5557.81</b>	2824.48
3	2	-5622.509	-5544.245	2822.255
3	3	-5628.568	-5543.188	<b>2826.284</b>
3	4	-5625.409	-5532.915	2825.705
4	0	-5479.987	-5408.838	2749.994
4	1	<b>-5633.172</b>	<b>-5554.908</b>	<b>2827.586</b>
4	2	-5625.643	-5540.263	2824.821
4	3	<b>-5633.732</b>	-5541.238	<b>2829.866</b>
4	4	<b>-5633.162</b>	-5533.553	<b>2830.581</b>

**Table S2:** Presented are the Akaike Information Criterion (AIC), Bayesian Information Criterion, and Log Likelihood (LL) for the various linear mixed effects models of the pressure reactivity index (PRx) modeled from the arterial blood pressure based cerebral oxygen index (COx\_a). For each model, the autoregressive (AR) and moving average (MA) order of the correction for autocorrelated residuals was varied from 0 to 4. The top four performing models by each criterion are in bold.

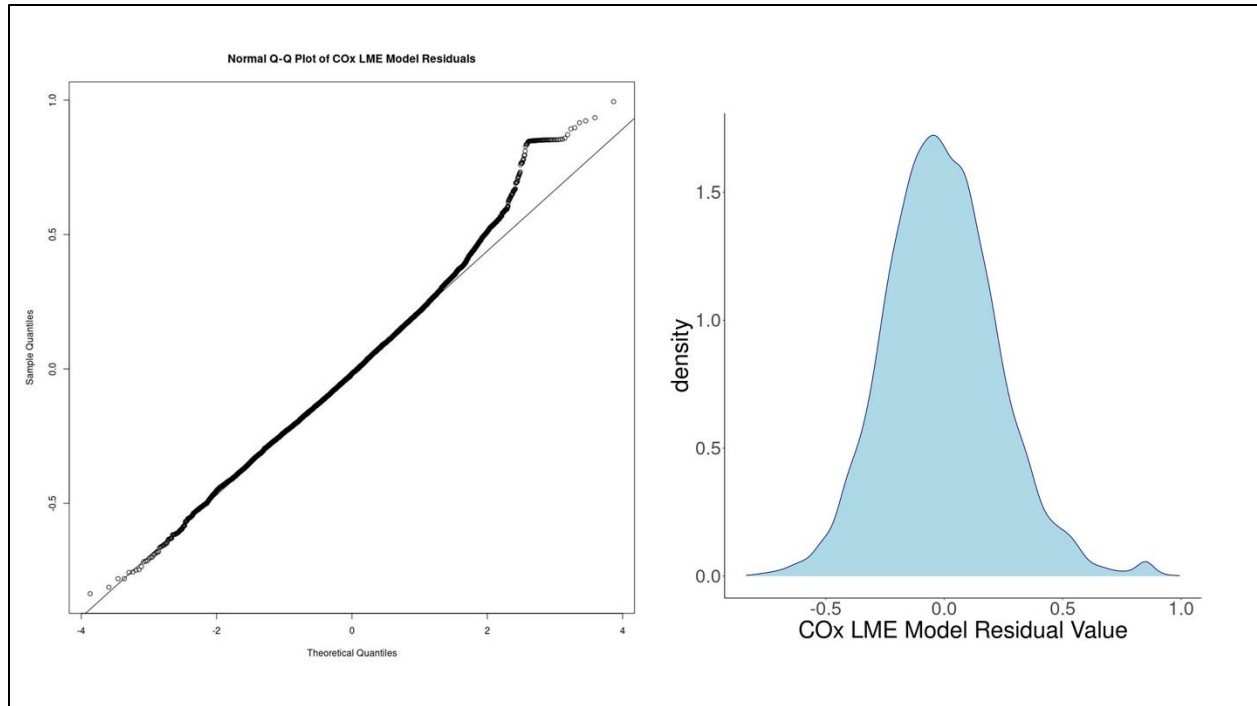
<u>AR Order</u>	<u>MA Order</u>	<u>AIC</u>	<u>BIC</u>	<u>LL</u>
0	0	-1317.431	-1274.742	664.7157
0	1	-3551.745	-3501.94	1782.872
0	2	-4259.803	-4202.883	2137.901
0	3	-4631.583	-4567.549	2324.791
0	4	-4868.566	-4797.417	2444.283
1	0	-4836.814	-4787.009	2425.407
1	1	-5476.539	-5419.619	2746.269
1	2	-5587.059	-5523.025	2802.53
1	3	-5599.298	-5528.148	2809.649
1	4	-5599.837	-5521.573	2810.919
2	0	-5201.64	-5144.72	2608.82
2	1	-5605.029	<b>-5540.995</b>	2811.515
2	2	<b>-5612.489</b>	<b>-5541.34</b>	2816.245
2	3	-5594.489	-5516.225	2808.244
2	4	-5600.492	-5515.113	2812.246
3	0	-5380.567	-5316.532	2699.283
3	1	-5609.273	<b>-5538.123</b>	2814.636
3	2	-5604.8	-5526.536	2813.4
3	3	-5609.565	-5524.186	2816.783
3	4	-5607.712	-5515.218	<b>2816.856</b>
4	0	-5460.73	-5389.581	2740.365
4	1	<b>-5614.835</b>	<b>-5536.57</b>	<b>2818.417</b>
4	2	-5606.785	-5521.406	2815.393
4	3	<b>-5616.421</b>	-5523.927	<b>2821.21</b>
4	4	<b>-5616.213</b>	-5516.604	<b>2822.106</b>



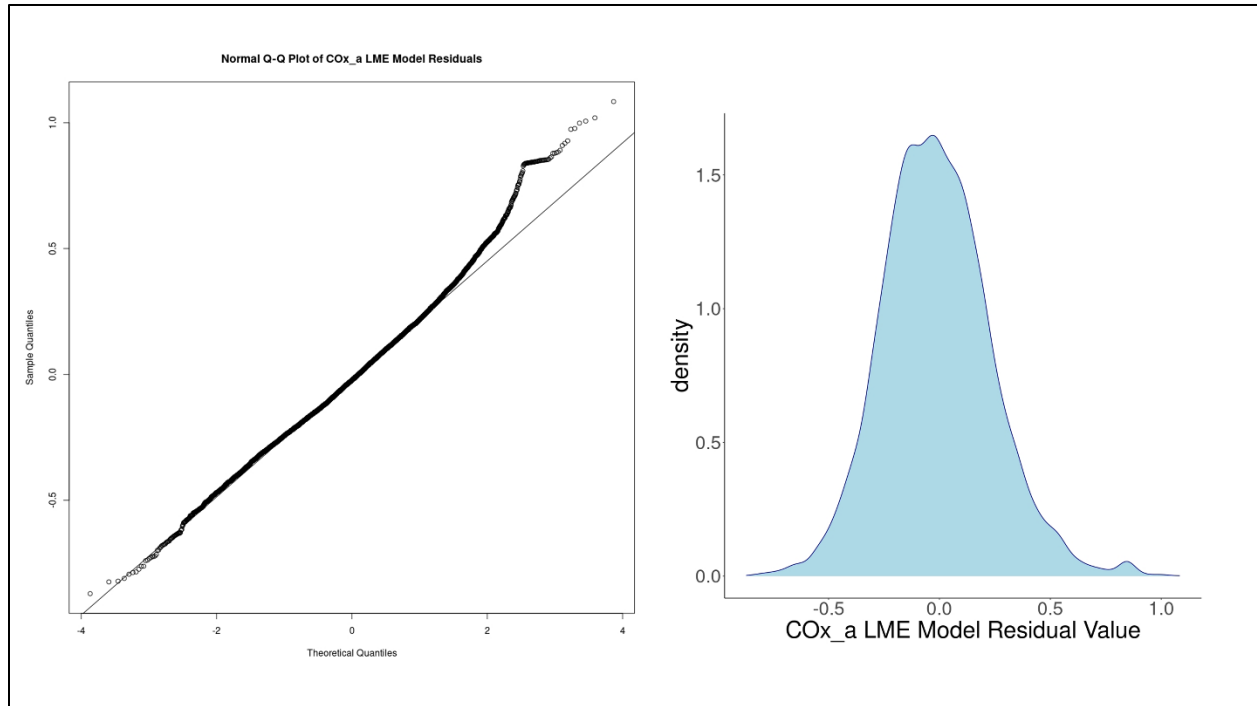
**Figure S1: Sample 30-minute-by-30-minute of the raw data parameters arterial blood pressure (ABP), intracranial pressure (ICP), cerebral perfusion pressure (CPP), regional cerebral oxygen saturation on the left (RS02\_L) and right (RS02\_R) over a 24 hour period for a single patient recorded with ICM+ software.**



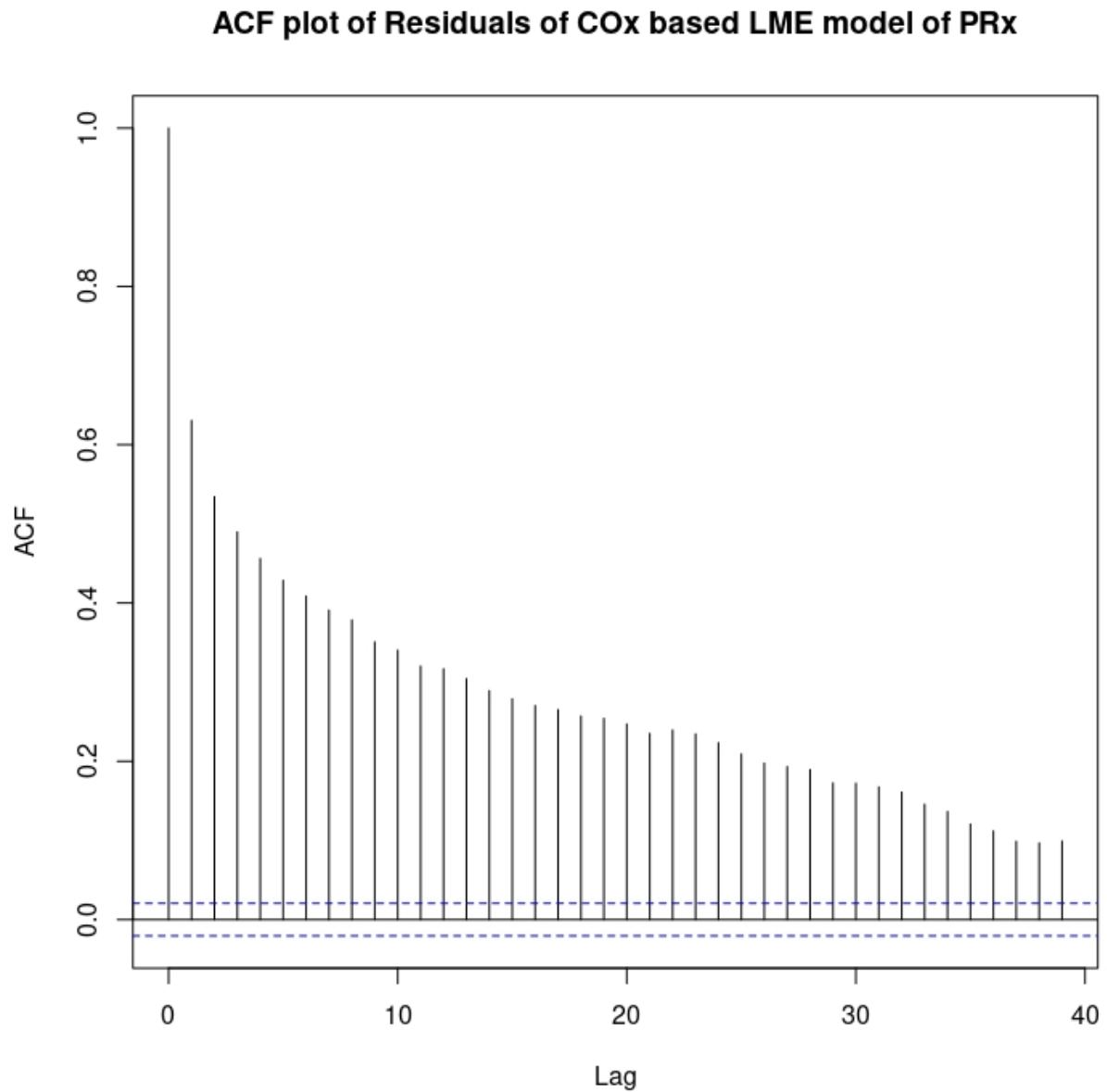
**Figure S2: Sample 30-minute-by-30-minute of the cerebrovascular reactivity metrics pressure reactivity index (PRx), cerebral perfusion pressure based cerebral oxygen index on the left (COX\_L) and right (COX\_R), as well as the arterial blood pressure based cerebral oxygen index on the left (COXA\_L) and right (COXA\_R) over a 24 hour period for a single patient calculated with ICM+ software.**



**Figure S3:** On the right is presented the density plot of the residuals of the selected linear mixed effects (LME) model with autoregressive order 4 and moving average order 1 of the pressure reactivity index (PRx) based on the cerebral perfusion pressure based cerebral oxygen index (COx). The Q-Q plot of the residuals in on the left. Both are consistent with normally distributed residuals.

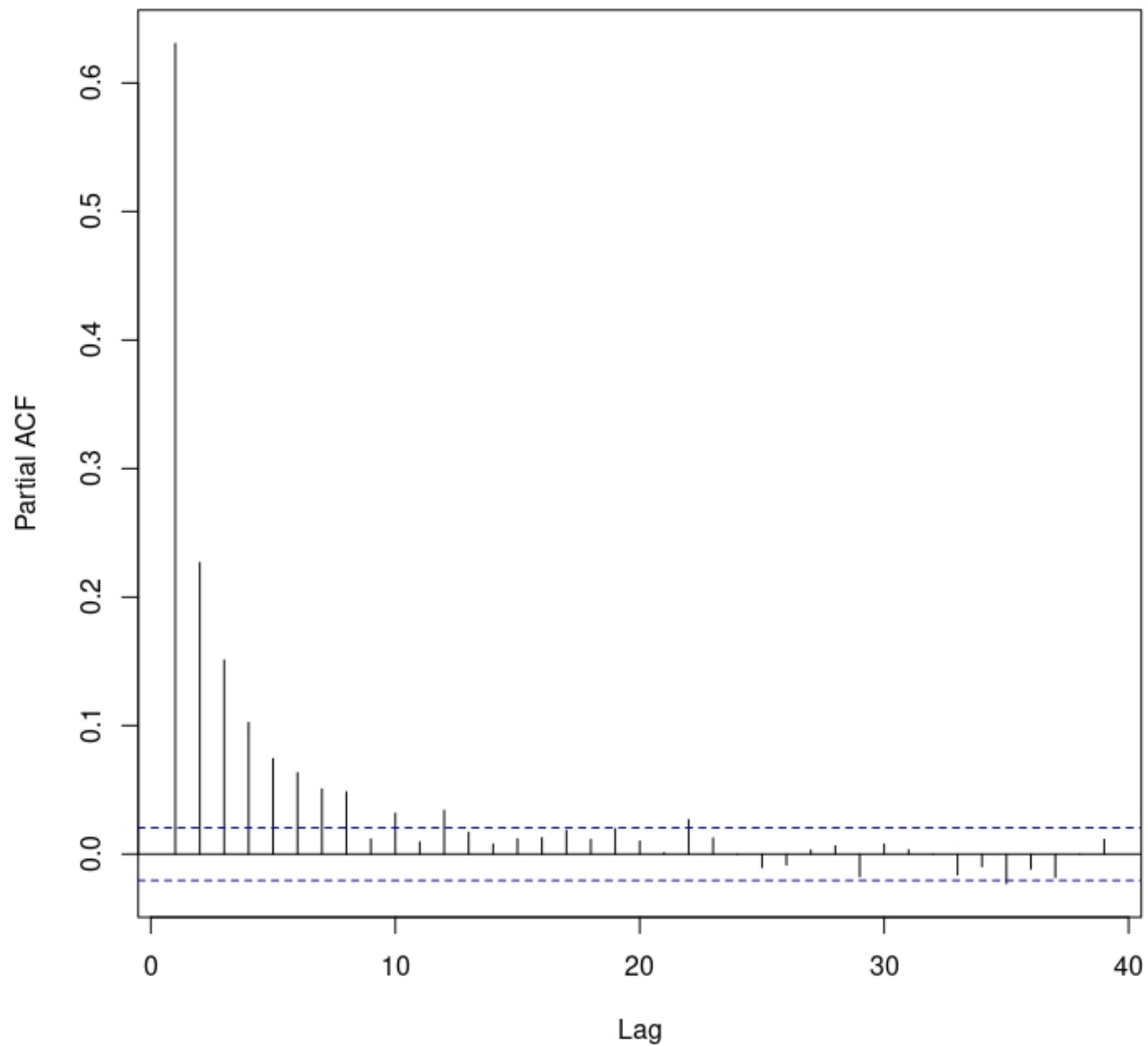


**Figure S4:** On the right is presented the density plot of the residuals of the selected linear mixed effects (LME) model with autoregressive order 4 and moving average order 1 of the pressure reactivity index (PRx) based on the arterial blood pressure based cerebral oxygen index (COx\_a). The Q-Q plot of the residuals in on the left. Both are consistent with normally distributed residuals.



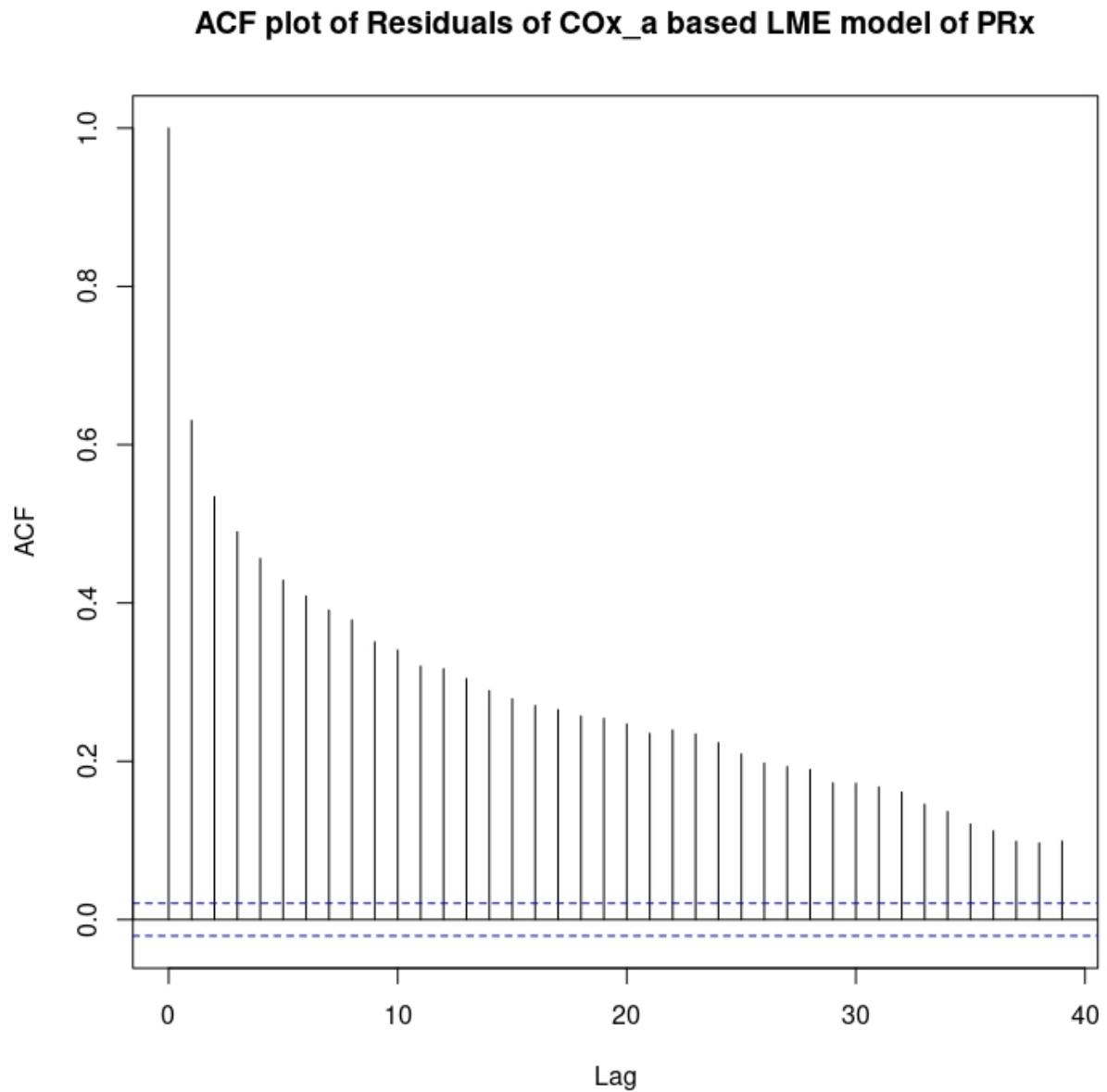
**Figure S5: The autocorrelative function (ACF) plot of the residuals of the selected linear mixed effects model (LME) of PRx based on COx. The dashed blue line represents the significance levels which were set to a correlation level of  $\pm(2/N^{1/2})$ , where N is the number of samples.**

**PACF plot of Residuals of COx based LME model of PRx**



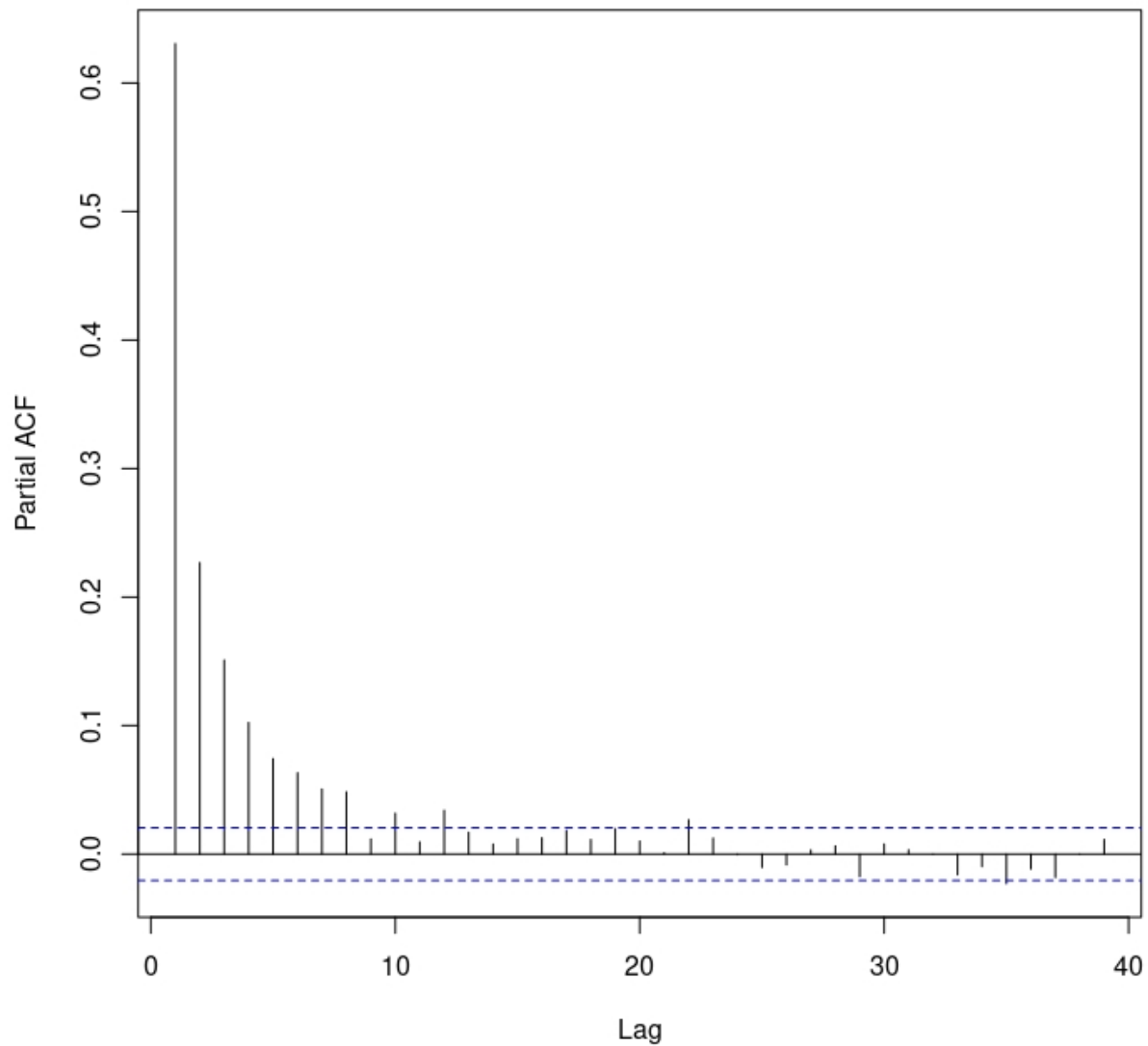
**Figure S6: The partial autocorrelative function (PACF) plot of the residuals of the selected linear mixed effects model (LME) of PRx based on COx. The dashed blue line represents the significance levels which were set to a correlation level of  $\pm(2/N^{1/2})$ , where N is the number of samples.**





**Figure S7: The autocorrelative function (ACF) plot of the residuals of the selected linear mixed effects model (LME) of PRx based on COx\_a. The dashed blue line represents the significance levels which were set to a correlation level of  $\pm(2/N^{1/2})$ , where N is the number of samples.**

**PACF plot of Residuals of COx\_a based LME model of PRx**



**Figure S8: The partial autocorrelative function (ACF) plot of the residuals of the selected linear mixed effects model (LME) of PRx based on COx\_a. The dashed blue line represents the significance levels which were set to a correlation level of  $\pm(2/N^{1/2})$ , where N is the number of samples.**