

**Table S1. PK Sampling (N=194)**

<b>Number of samples collected during RRT<sup>1</sup></b>	<b>Number of samples also included in previous study<sup>2</sup> (n, %)</b>	<b>Total number of samples (n, %)</b>	<b>Concentrations<sup>3</sup> (mg/L)</b>
<i>Peak concentrations</i>			
17 (8.8%)	27 (13.9%)	106 (54.6%)	34.5 ± 16.1
<i>Trough concentrations</i>			
8 (4.1%)	6 (3.1%)	41 (21.1%)	29.1 ± 15.3
<i>Other</i>			
5 (2.6%)	7 (3.6%)	47 (24.2%)	32.7 ± 16.4
<b>Total</b>			
30 (15.5%)	40 (20.6%)	194 (100%)	32.9 ± 16.0

<sup>1</sup>Excluding slow continuous ultrafiltration

<sup>2</sup>Samples collected in 10 patients (representing 29% of the subjects in the current study)

<sup>3</sup>Mean value ± SD

*RRT: renal replacement therapy*

**Reference**

*Thibault C, Massey SL, Naim MY, Abend NS, Zuppa AF. Population Pharmacokinetics of IV Phenobarbital in Neonates After Congenital Heart Surgery. Pediatric Critical Care Medicine. 2020;21(8):e557-e565.*

**Table S2. Model progression**

Description	OFV	$\Delta$ OFV	AIC	$\Delta$ AIC
<i>Univariable analysis – age and maturation</i>				
Base model <sup>1</sup>	1106	.	1116	.
Age on CL	1096	-10	1108	-8
<b>Age on CL – Hill equation</b>	<b>1094</b>	<b>-12</b>	<b>1106</b>	<b>-10</b>
PMA on CL	1101	-5	1113	-3
<i>Univariable analysis</i>				
<b>RRT on CL</b>	<b>790</b>	<b>-304</b>	<b>804</b>	<b>-302</b>
SCUF on CL	1051	-43	1065	-41
SCR on CL	920	-174	934	-172
<i>Multivariable analysis, 1<sup>st</sup> step</i>				
Midazolam on CL	786	-4	802	-2
<b>Albumin on V</b>	<b>783</b>	<b>-7</b>	<b>799</b>	<b>-5</b>
<i>Multivariable analysis, 2<sup>nd</sup> step</i>				
Midazolam on CL	779	-4	797	-2
<b>Age on V</b>	<b>776</b>	<b>-7</b>	<b>794</b>	<b>-5</b>
<i>Backward Analysis, 1<sup>st</sup> Step</i>				
<b>Drop age on V</b>	<b>783</b>	<b>+7</b>	<b>799</b>	<b>+5</b>
Drop albumin on V	787	+8	803	+9
Drop RRT on CL	1088	+312	1104	+310
<i>Backward Analysis, 2<sup>nd</sup> Step</i>				
<b>Drop albumin on V</b>	<b>790</b>	<b>+7</b>	<b>804</b>	<b>+5</b>
Drop RRT on CL	1092	+309	1106	+307
<i>Backward Analysis, 3<sup>rd</sup> Step</i>				
Drop RRT on CL	1094	+304	1106	+302

<sup>1</sup>Base model includes weight on clearance and volume of distribution

AIC: Akaike Information Criteria, CL: clearance, ECMO: extracorporeal membrane oxygenation, PMA: postmenstrual age, OFV: Objective Function Value, RRT: renal replacement therapy, SCR: serum creatinine, SCUF: slow continuous ultrafiltration, V: volume of distribution