

SUPPLEMENTARY MATERIAL FOR
Prediction of risk of neurological injury for children on ECMO:
Development of \mathcal{RNIS}

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Appendix A.

Appendix A.1. *Discretization*

Table A1 presents the ranges of values used to discretize the continuous valued variables for learning the scoring function, \mathcal{RNIS} .

Table A1: Discretization bins

Variable	Bin
VA ECMO mode	
pH	$[-\infty, 7.0), [7.0, 7.2), [7.2, 7.35), [7.35, 7.45), [7.45, \infty)$
DeltapH	$[-\infty, -0.5), [-0.5, -0.1), [-0.1, 0), [0, 0.1), [0.1, 0.5), [0.5, \infty)$
HCO324	$[-\infty, 10), [10, 18), [18, 24), [24, 32), [32, \infty)$
SaO2	$[-\infty, 70), [70, 80), [80, 88), [88, 92), [92, \infty)$
HCO3	$[-\infty, 10), [10, 18), [18, 24), [24, 32), [32, \infty)$
AgeDays	$[-\infty, 30), [30, 180), [180, 360), [360, 1800), [1800, 4320), [4320, \infty)$
RelativePCO2	$[-\infty, -0.5), [-0.5, -0.3), [-0.3, -0.1), [-0.1, 0.1), [0.1, 0.3), [0.3, 0.5), [0.5, \infty)$

PO224	$[-\infty, 60), [60, 110), [110, 200), [200, \infty)$
FiO2	$[-\infty, 20), [20, 40), [40, 60), [60, \infty)$
pH24	$[-\infty, 7.0), [7.0, 7.2), [7.2, 7.35), [7.35, 7.45), [7.45, \infty)$
Fio224	$[-\infty, 20), [20, 40), [40, 60), [60, \infty)$
relativeNormaMeanBPPerct	$[-\infty, -0.5), [-0.5, -0.3), [-0.3, -0.1), [-0.1, 0.1), [0.1, 0.3), [0.3, 0.5), [0.5, \infty)$
VV ECMO mode	
pH	$[-\infty, 7.0), [7.0, 7.2), [7.2, 7.35), [7.35, 7.45), [7.45, \infty)$
pH24	$[-\infty, 7.0), [7.0, 7.2), [7.2, 7.35), [7.35, 7.45), [7.45, \infty)$
relativeNormaMeanBPPerct	$[-\infty, -0.5), [-0.5, -0.3), [-0.3, -0.1), [-0.1, 0.1), [0.1, 0.3), [0.3, 0.5), [0.5, \infty)$
RelativePCO2	$[-\infty, -0.5), [-0.5, -0.3), [-0.3, -0.1), [-0.1, 0.1), [0.1, 0.3), [0.3, 0.5), [0.5, \infty)$
PCO2	$[-\infty, 30), [30, 50), [50, 65), [65, \infty)$
HCO324	$[-\infty, 10), [10, 18), [18, 24), [24, 32), [32, \infty)$
PO224	$[-\infty, 60), [60, 110), [110, 200), [200, \infty)$
PumpFlow4	$[-\infty, 0.35), [0.35, 0.45), [0.45, 1.0), [1.0, \infty)$
PO2	$[-\infty, 60), [60, 110), [110, 200), [200, \infty)$
DeltapH	$[-\infty, -0.5), [-0.5, -0.1), [-0.1, 0), [0, 0.1), [0.1, 0.5), [0.5, \infty)$
DeltaPO2	$[-\infty, -100), [-100, -50), [-50, 0), [0, 50), [50, 100), [100, \infty)$

Appendix A.2. *Preprocessing*

Table A2 presents the variables that were removed during preprocessing. Leak variables are highlighted with ¹ and variables removed by clinician input are highlighted with ². Common-carotidartery, siteID_11, siteID_9 were removed only for VV ECMO. CannulaType_DualLumen was removed only for VA ECMO.

DeltaPCO2	Discontinuation ¹	SupportType ²
CannulaType_Arterial ²	modeType ²	Percutaneous_No ²
CannulaType_Venous ²	PEEP24	CNSdiffuseischemia ¹
PumpFlow24_weight	Race ²	MeanBP ²
ParenchymalCNShemorrhage ¹	siteID_10 ²	IschemicStroke ¹
CNSHemorrhage ¹	CNSInfarction ¹	SeizuresClinical ¹
MeanBP24 ²	SeizuresEEG ¹	Hispanic ²
OI	PatientID ²	PumpFlow24
Percutaneous_Unknown ²	SigniNeurologicalInjury ¹	PumpFlow4_Weight
BrainDeath ¹	DischargedAlive ¹	HoursECMO ¹
Neonatal	siteID_99 ²	White ²
TimeOffToExtubationDateHours	MeanAP	Height
IntraventricularCNSHemorrhage ¹	VentType	Black ²
CannulaType_DistalLimb ²	Intracranialhemorrhage ¹	Seizures ¹
Delta_Normalized_MeanBP ²	IntubationToTimeOnHours	Delta_PO2
AgeGroup ²	YearECLS ²	CannulaType_NULL ²
PIP24		

Table A2: Variables removed during preprocessing. Variables marked with ¹ were leak variables. Variables marked with ² were removed by clinician input.

Appendix A.3. Feature Elimination

Tables A4 and A3 present the features that were removed as part of feature elimination stage. Essentially, these variables and the variables in \mathcal{RNTS} form the complete set of variables that were considered for the automated feature ranking process.

siteID_27	HTNrequiringvasodilators	TherapeuticHypothermia
VasopressorsSingle	Vasopressors	siteID_2
siteID_3	siteID_17	siteID_12
siteID_21	AgeDays	Steroids
MetaSeverehemolysis	siteID_22	normalizedMeanBP
phenylephrine	PulmonaryHypertension	Delta_Normalized_PercentilesBP
Aorta	preECMOratio	siteID_24
MechAirincircuit	siteID_16	HemoCannulationsitebleeding
Percutaneous_Yes	Pertussis	CongenitalAirwayAnomalies
AspirationPNA	MetaModerateHemolysis	OrganTXincludingheartlungBMT
Vasopressin	HemoDIC	DeltapH
Dobutamine	PulmonaryHemorrhage	ChronicRespiratoryFailure
siteID_8	MetaGlucoseLT40	ViralorBacterialPneumonia
NitricOxide	siteID_15	GeneticsMetabolics
DeltameanBP	MetapHLT7_2	DrowningInhalationForeignBody
Cardiacrrhythmia	CannulaType_DualLumen	CardiacDisincludingInfectious
Transplant_Yes	Femoralartery	MechThrombosisClotscircuit
CDH	FiO2	milrinone
FungalPneumonia	normalizedMeanBPPercentiles	Fio224
Sex_Male	siteID_20	TraumaincludingTBI
Hemolysis	siteID_0	MechCircuitChange
siteID_5	RenalCrGT3	AcuteRespiratoryFailure
CardioCPRrequired	HighFrequencyVentilation	siteID_13
RenalCr15_3	HemoPerimediastinalcannubled	CongenitalHeartDisease
PCO224	CardiopulmonaryBypass	normalizedMeanBP24
Sildenafil	ProcintrapostOperative	DeltaPO2
siteID_23	normalizedMeanBP24Percentiles	siteID_26
MechClotshemofilter	MetaGlucoseGT240	siteID_14
Norepinephrine	siteID_4	siteID_19
MetapHGT7_6	MetaHyperbilirubinemia	HemoSurgicalSitebleeding
Bronchiolitis	OtherRespiratorydiseases	SaO2
siteID_18	Asthma	SepsisMeningitisExcMyocarditis
siteID_6	Tamponade	SaO224
PO2	siteID_1	inamrinone
MechClotsAirEmboli	HemeImmuno	CardioInotropesneededECLS

Table A3: Variables removed for VV ECMO after ranking

siteID_27	HTNrequiringvasodilators	TherapeuticHypothermia
VasopressorsSingle	PCO2	Vasopressors
siteID_2	siteID_3	siteID_17
siteID_12	siteID_21	Steroids
MetaSevereHemolysis	siteID_22	normalizedMeanBP
Delta_Normalized_PercentilesBP	PulmonaryHypertension	PumpFlow4
phenylephrine	Aorta	preECMOratio
CongenitalAirwayAnomalies	MechAirincircuit	siteID_16
HemoCannulationsitebleeding	siteID_24	Percutaneous_Yes
AspirationPNA	MetaModerateHemolysis	Vasopressin
OrganTXincludingheartlungBMT	HemoDIC	ChronicRespiratoryFailure
PulmonaryHemorrhage	Dobutamine	MetaGlucoseLT40
ViralorBacterialPneumonia	siteID_8	NitricOxide
DrowningInhalationForeignBody	GeneticsMetabolics	siteID_15
MetapHLT7_2	DeltameanBP	Cardiacrrhythmia
CardiacDisinfectingInfectious	Transplant_Yes	Femoralartery
MechThrombosisClotscircuit	CDH	siteID_9
milrinone	FungalPneumonia	OncologyExcludingBMT
normalizedMeanBPPercentiles	Fio224	Sex_Male
siteID_20	TraumaincludingTBI	siteID_0
MechCircuitChange	siteID_5	RenalCrGT3
AcuteRespiratoryFailure	CardioCPRrequired	HighFrequencyVentilation
HemoPerimediastinalcannubled	siteID_13	PCO224
CongenitalHeartDisease	CardiopulmonaryBypass	Dopamine
normalizedMeanBP24	Sildenafil	ProcintrapostOperative
normalizedMeanBP24Percentiles	siteID_23	DeltaPO2
siteID_26	MechClotshemofilter	MetaGlucoseGT240
siteID_14	Norepinephrine	siteID_4
siteID_19	MetapHGT7_6	HemoSurgicalSitebleeding
Bronchiolitis	OtherRespiratorydiseases	siteID_18
Asthma	siteID_6	siteID_11
Tamponade	SaO224	PO2
siteID_1	inamrinone	MechClotsAirEmboli
CardioInotropesneededECLS	HemeImmuno	

Table A4: Variables removed for VA ECMO after ranking