

## NeuroSurgical Procedures in Patients Requiring ECMO (NSPIRE)

### Supplemental Digital Content

Ryan Lee, MD<sup>1\*</sup>, Samantha Helmy, BA<sup>2</sup>, Jeronimo Cardona, BS<sup>3</sup>, David Zhao, BA<sup>4</sup>, Raymond Rector, BS<sup>5</sup>, Joseph Rabin, MD<sup>6</sup>, Michael Mazzeffi, MD, MPH, MSc<sup>7</sup>, Sung-Min Cho, DO, MHS<sup>8</sup>, Gunjan Parikh, MD<sup>9</sup>, Nicholas A. Morris, MD<sup>10</sup>, Imad Khan, MD<sup>11</sup>

### Table of Contents

1. Supplementary Table 1. Demographics and Outcomes. Page 2.
2. Supplementary Table 2. ECMO Data. Page 3.
3. Supplemental Institutional Review Board (IRB) Information. Page 4.

**Supplementary Table 1. Demographics and Outcomes.**

<b>Characteristic<sup>§</sup></b>	<b>All (n=24)</b>	<b>VV (n=12)</b>	<b>VA (n=12)</b>	<b>p</b>
Age	41 ± 16	34 ± 15	48 ± 15	.04
Male	21 (88)	11 (92)	10 (83)	.54
ICU LOS	38 ± 50	47 ± 68	28 ± 20	.62
Hospital LOS	43 ± 50	50 ± 67	36 ± 25	.84
Indication for ECMO				
ARDS	12 (50)	11 (92)	1 (8)	<.001
Cardiogenic shock	6 (25)	0 (0)	6 (50)	.005
Cardiac arrest*	6 (25)	1 (8)	5 (42)	.06
Admission GCS <sup>†</sup>	9 (5, 15)	6 (4, 9)	10 (8, 15)	.09
Survival to ECMO decannulation	16 (67)	7 (58)	9 (75)	.39
Survival to Discharge	15 (63)	7 (58)	8 (67)	.67
Favorable Discharge CPC (1-2)	12/15 (80)	6/7 (86)	6/8 (75)	.60
Care withdrawn	6 (25)	3(25)	3(25)	1

ARDS: acute respiratory distress syndrome. CPC: cerebral performance category. ECMO: extracorporeal membrane oxygenation. GCS: Glasgow coma scale. ICU: intensive care unit. LOS: length of stay. SOFA: sequential organ failure assessment. VA: venoarterial. VV: venovenous. IQR: interquartile range. <sup>§</sup>All data noted as n (%), mean ± standard deviation, or median (1<sup>st</sup>, 3<sup>rd</sup> percentile). \*Cardiac arrest was denoted as indication if patient experienced any cardiac arrest immediately preceding ECMO cannulation, regardless of presence of ARDS or cardiogenic shock. <sup>†</sup>n=22 patients with Admission GCS scores.

**Supplementary Table 2. ECMO Data.**

<b>ECMO Data<sup>§</sup></b>	<b>Overall (n=24)</b>	<b>VV (n=12)</b>	<b>VA (n=12)</b>	<b><i>p</i></b>
Femoral-Femoral	18 (75)	8 (67)	10 (83)	.35
Femoral-Internal Jugular	6 (25)	4 (33)	2 (17)	.35
Duration of ECMO (hours)	251 ± 307	343 ± 410	159 ± 104	.27
<b>Cannulation day characteristics</b>				
GCS*	3 (3, 9)	3 (3, 4.5)	6.5 (3, 11.25)	.19
SOFA score**	11 (8, 13)	8 (8, 8)	12 (11, 14)	.005
PaO <sub>2</sub> (mmHg)†	79 ± 70	67 ± 10	90 ± 98	.71
Bilirubin (mg/dL)*	0.85 ± 0.64	0.65 ± 0.31	1.00 ± 0.80	.31
Creatinine (mg/dL)†	1.24 ± 0.69	0.86 ± 0.32	1.57 ± 0.78	.02
Platelets (x10 <sup>3</sup> )†	229 ± 169	246 ± 56	213 ± 232	.09
Lactate (mmol/L)††	7 ± 6	3 ± 2	11 ± 6	.001
INR*	1.44 ± 0.62	1.20 ± 0.21	1.64 ± 0.77	.047
<b>Anticoagulation</b>				
Heparin	15 (63)	8 (67)	7 (58)	.67
Ticagralor	1 (4)	0	1 (8)	.31
Bivalrudin	1 (4)	0	1 (8)	.31
None	7 (29)	4 (33)	3 (25)	.65
Patients requiring reversal	1 (4)	1 (8)	0	.31
<b>Complications of ECMO</b>				
Systemic hemorrhage	12 (50)	7 (58)	5 (42)	.41
Anemia	7 (29)	3 (25)	4 (33)	.65
Thrombocytopenia	7 (29)	3 (3)	4 (33)	.65
Limb Ischemia	2 (8)	2 (17)	0	.14
Anoxic Brain Injury	2 (8)	1 (8)	1 (8)	1
Seizure	0	0	0	1
Acute Ischemic Stroke	4 (17)	0	4 (33)	.03
Other†††	1 (4)	0	1 (8)	.31

ECMO: extracorporeal membrane oxygenation. GCS: Glasgow coma scale. INR: international normalized ratio. IQR: interquartile range. SOFA: sequential organ failure assessment. VA: venoarterial. VV: venovenous. <sup>§</sup>All data noted as n (%), mean ± standard deviation, or median (1<sup>st</sup>, 3<sup>rd</sup> percentile). \*Data available in n=22. \*\*Data available in n=19. †Data available in n=23. ††Data available in n=20. †††Posterior reversible encephalopathy syndrome, scattered foci of new parenchymal/subarachnoid hemorrhage, and cerebral edema.

NeuroSurgical Procedures in Patients Requiring ECMO (NSPIRE)

Supplemental Institutional Review Board (IRB) Information

University of Maryland, Baltimore Institutional Review Board. Approval number HCR-HP-00063627-7. Approval date April 13, 2022. “Adult Extracorporeal Membrane Oxygenation: A Review of Neuroimaging.”

University of Rochester Medical Center Institutional Review Board. Approval number STUDY00007710. Approval date November 15, 2022. “NSPIRE – NSGY in ECMO.”

Johns Hopkins Hospital Institutional Review Board. Approval number IRB00216321. Approval date October 22, 2019. “Retrospective Analysis of Outcomes of Patients on Extracorporeal Membrane Oxygenation.”

University of Virginia Health System Institutional Review Board. Approval number 24266. Approval date January 19, 2023. “Retrospective cohort study of UVA adult ECMO experience.”