INOTROPIC SUPPORT IN NEONATES REQUIRING ECMO FOR RESPIRATORY FAILURE

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Background

- The preferential selection of VV versus VA ECMO in neonates with respiratory failure unresponsive to medical management varies across centers.
- Historical data shows improved survival in patients treated with VV ECMO and less neurologic sequelae *Thiagarajan 2017, Wein 2017*, *Rais Bahrami 2014*
  - Complicated by differences in degree of illness between VV and VA patients
  - CDH patients matched for level of illness show equal survival but less neurologic complications *Guner 2009*
- Common rationale for choosing VA ECMO include degree of inotropic support and ventricular dysfunction *Bamat 2017*
- *Few reports exist describing the use of VV ECMO inotrope dependent neonates (Roberts 2003)*

Objective

- Evaluate the vasoactive/inotropic support in neonates receiving ECMO at a single institution.
- Our institution uses primarily VV+V for all patients

Methods:

- Retrospective chart review neonates (< 30d)
- ECMO for respiratory failure at CHOA between January 1, 2010 and December 1, 2017

- Primary VA (+V) and infants converted from VV to VA were classified in the VA group for further analysis.
- Maximum vasoactive score (VIS) prior to cannulation was calculated.
- Descriptive statistics and univariate analysis used to evaluate differences between groups.

Vasoactive Score

dopamine dose (mcg/kg/min)

dobutamine dose (mcg/kg/min)

epinephrine dose (mcg/kg/min) x 100

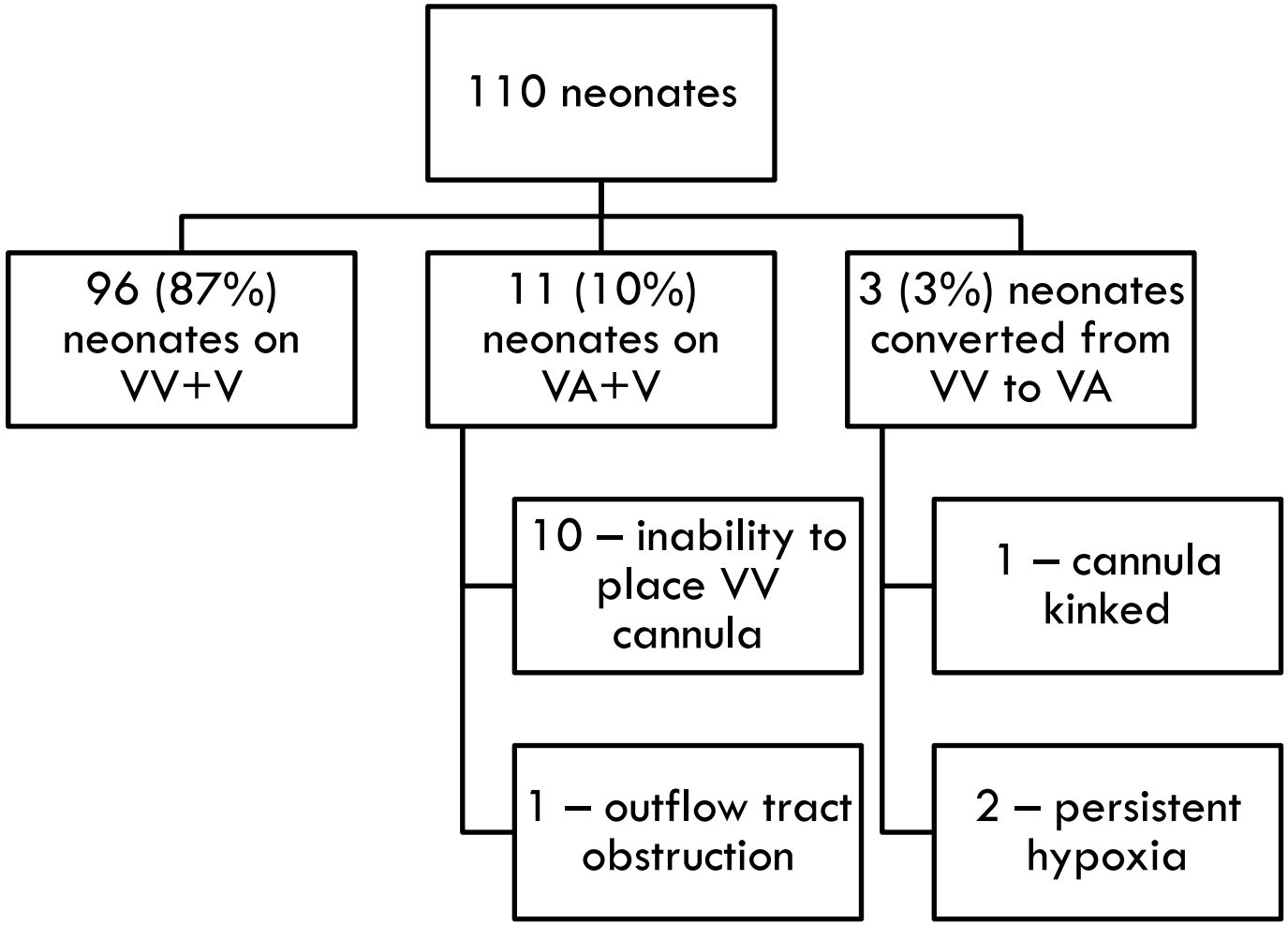
milrinone dose (mcg/kg/min) x 10

\+ vasopressin dose (units/kg/min) x 10,000

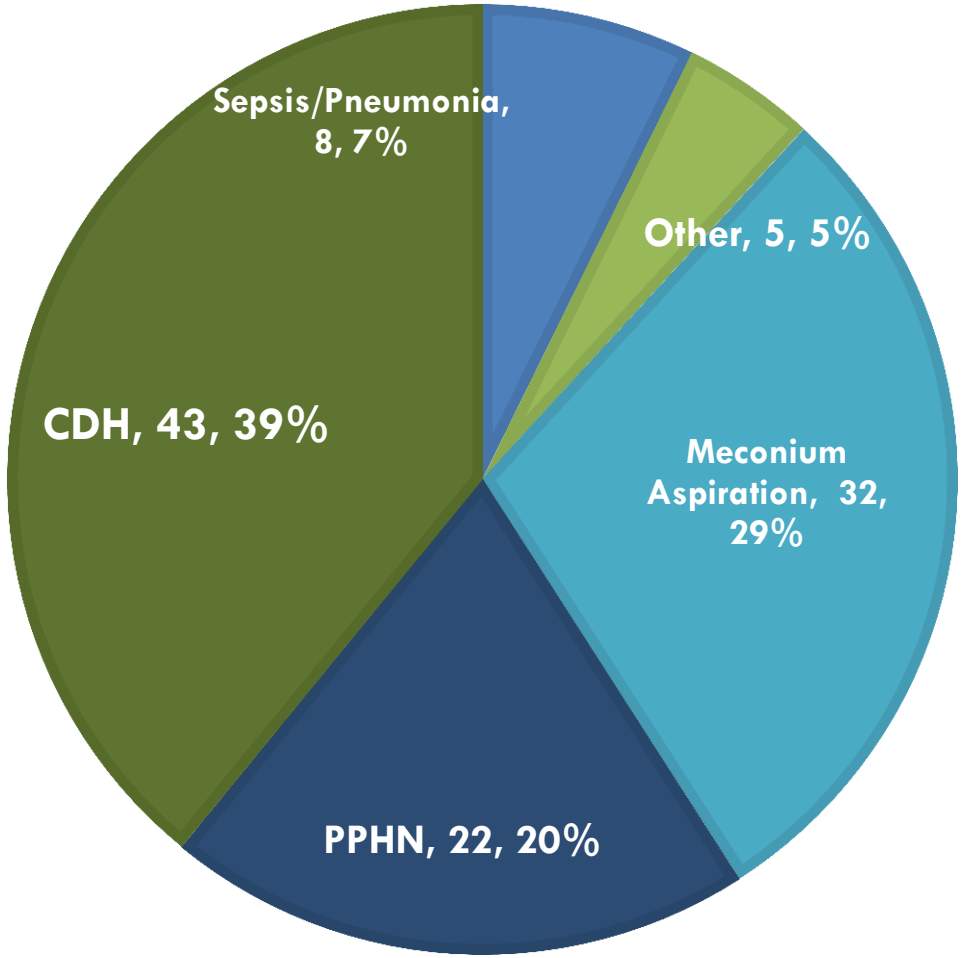
norepinephrine dose (mcg/kg/min) x 100

Gaies 2014, McIntosh 2017

Results: Study Population



Results: Population by diagnosis

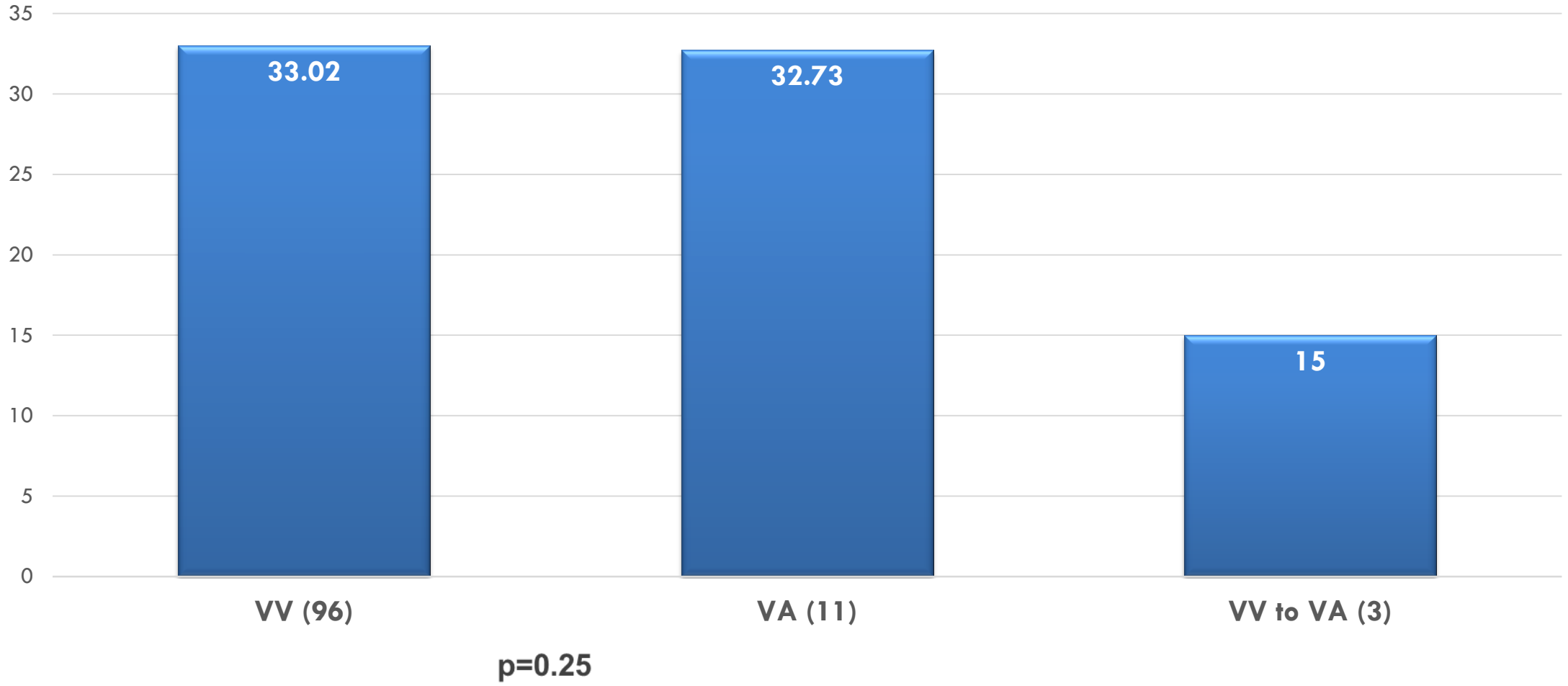


Other: HCOM (1), pulmonary hypoplasia (3), blood aspiration (1)

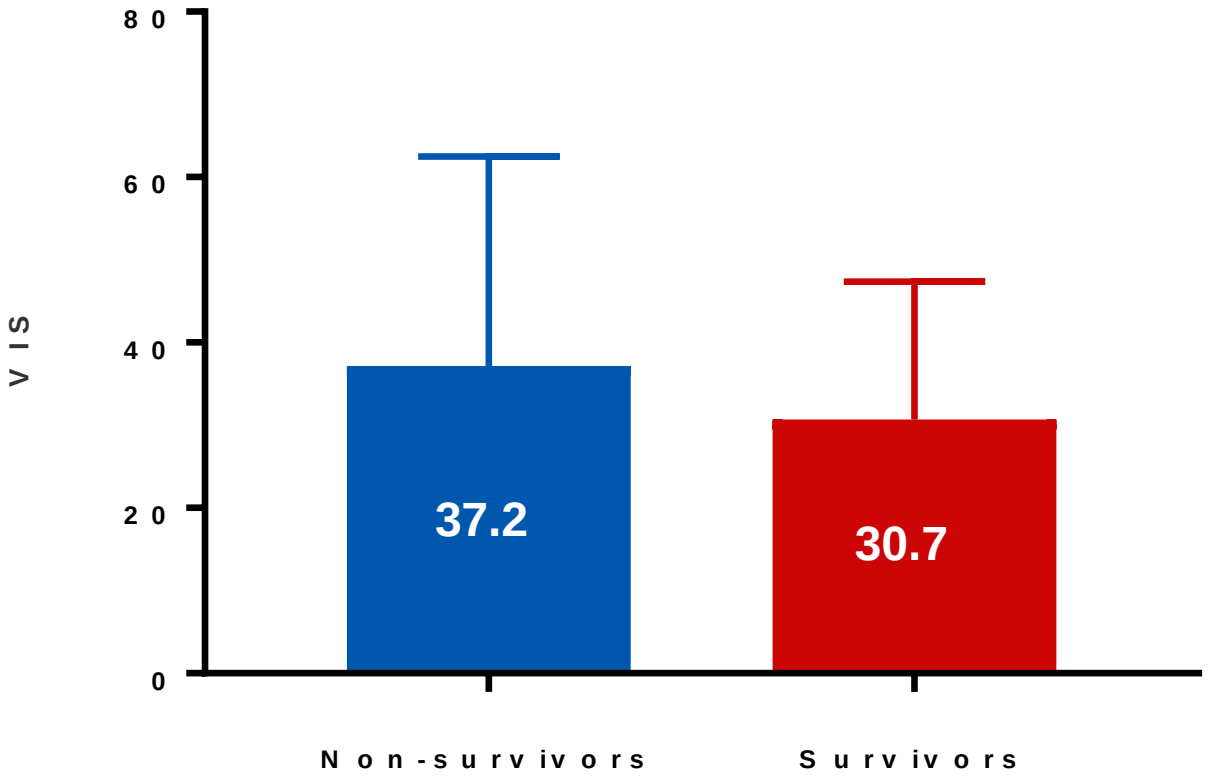
Results: Clinical & Demographic Characteristics

	Non-CDH (67)	CDH (43)	Overall (110)
Gestational Age	38 and 6/7	37 and 6/7	38 and 3/7
Weight	3.4 kg	3.1 kg	3.3 kg
5 minute Apgar	6.4 +/- 2.2	6.4 +/- 2	6.4 +/- 2
OI	51.7 +/- 23	49.3 +/- 24	50.1 +/- 23
VIS	33.7 +/- 22	30.6 +/ 14	32.5 +/- 19
Neo-Rescuers	-1.93	0.009	-1.17
ECMO Mode VV+V	59 (88%)	37 (86%)	96 (87%)
VA+V	7 (10%)	4 (9.3%)	11 (10%)
VV→VA	1 (1.5%)	2 (4.6%)	3 (2.7%)
ECMO days	6.8 (+/- 3.8)	10.1 (+/- 5)	8.1 (+/- 5)
Survival to Discharge	85% (57/67)	51% (22/43)	72% (79/110)

Results: Mean VIS by Cannulation Type

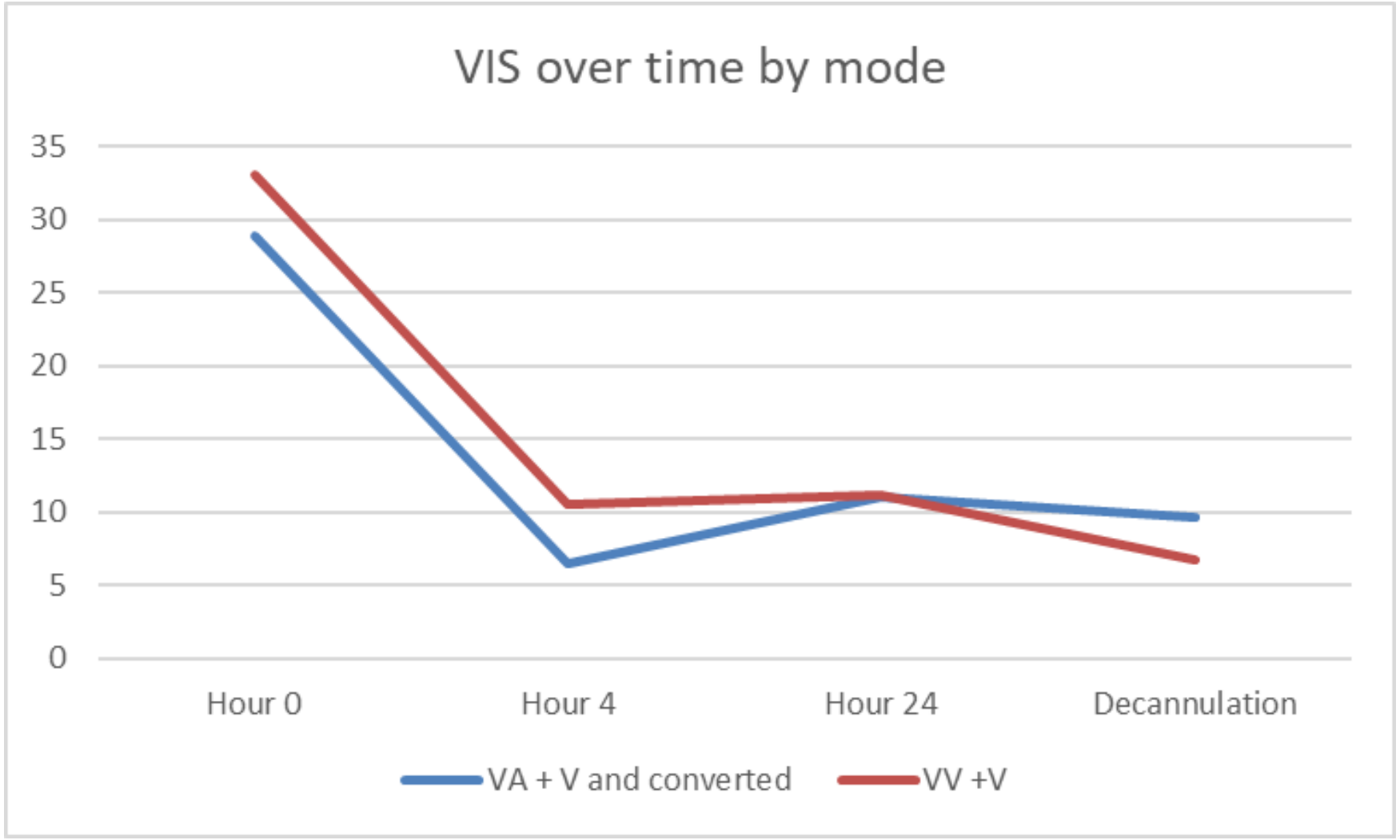


Results: VIS and mortality

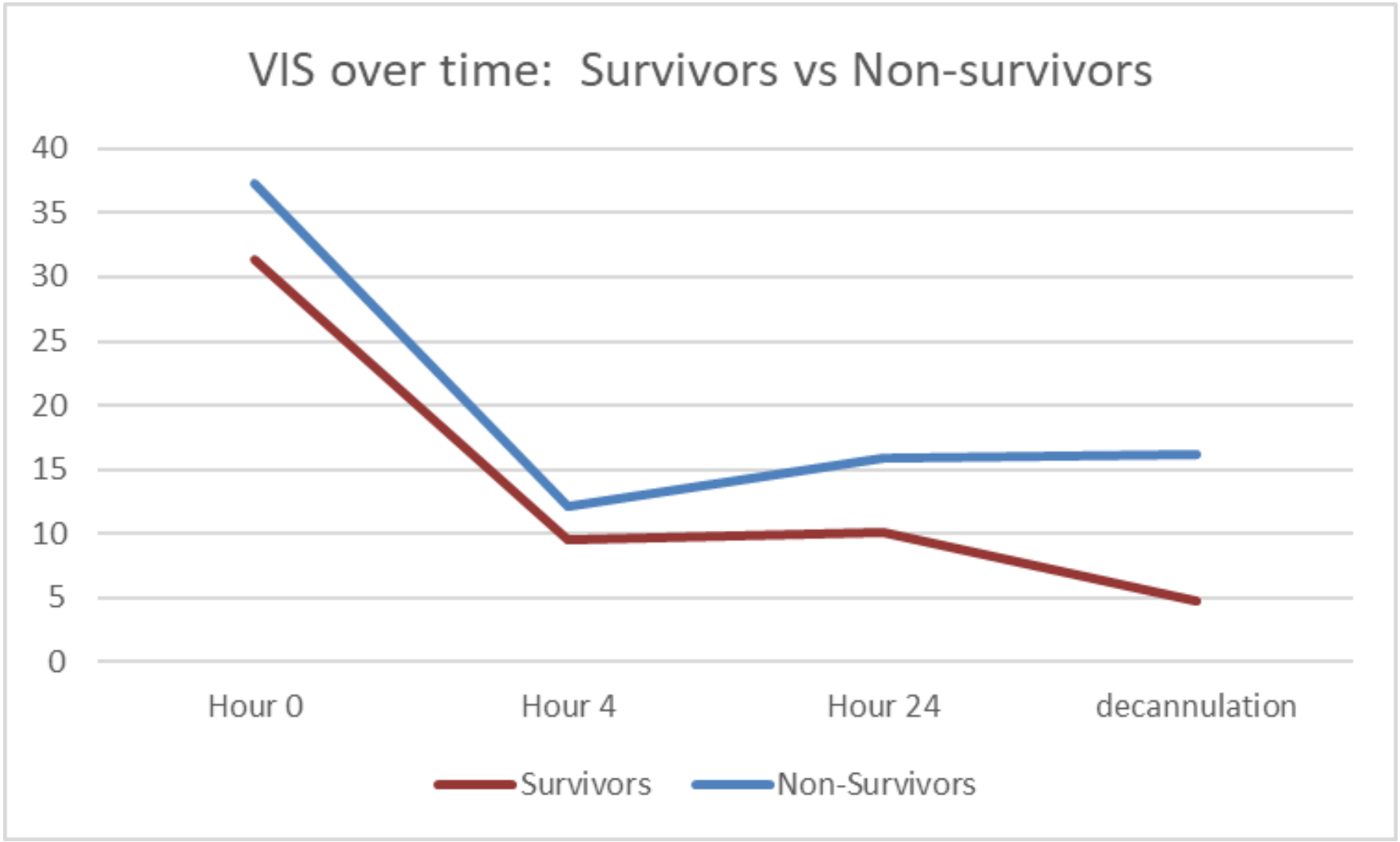


- P = 0.12 for difference between groups
- However VIS > 40 was predictive of mortality 11/23, 48% vs 20/87, 23% (p=0.02)

Results: VIS over Time



Results: VIS over time



Complications

Category	Complication	Frequency	VA	VV	p
Mechanical	Cannula problems or circuit kinking/leaking/air	14/110 (12.7%)	1/14 (7%)	13/96 (13.5%)	NS
	Clots (cannula, filter, oxygenator)	12/110 (10.9%)	4/14 (28.6%)	8/96 (8.3%)	p=0.05
Hematologic	Cannula site bleeding	6/110 (5.5%)	2/14 (14%)	4/96 (4.2%)	NS
	DIC (circuit)	13/110 (11.8%)	3/14 (21%)	10/96 (10.4%)	NS
Neurologic	Seizures (clinical)	3/110 (2.7%)	2/14 (14%)	1/96 (1%)	p=0.04
	CNS hemorrhage	11/110 (10%)	3/14 (21%)	8/96 (8.2%)	p=0.15
	CNS infarct	2/110 (1.8%)	2/14 (14%)	--	p=0.02
Renal	Creatinine > 1.5	4/110 (3.6%)*	--	4/96 (4.2%)	NS
Cardiac	Inotropes on ECMO	24/110 (21.8%)	2/14 (14%)	22/96 (23%)	NS (p=0.7)
	Arrythmias, Stun (0)	4/110 (3.6%)	--	4/96 (4.2%)	NS
	Hypertension	1/110 (0.9%)	--	1/96 (1%)	NS

Conclusions

- Neonates with respiratory failure can be successfully managed on VV ECMO even with considerable vasoactive/inotropic requirements.
- The use of VV over VA ECMO may have the advantage of decreasing the risk of neurologic sequelae associated with VA ECMO.
- Future study to include cardiac function by echocardiogram in addition to VIS and more detailed analysis of neuroimaging studies on this population

Questions?

- A big thank you to our ECMO team, especially Joel Davis and Justin Young for all this data collection and everyone for the “work” of VV+V ECMO