



Evaluating Lateral Differences in Brain4Care Intercranial Pressure Waveforms in Neurocritical Patients

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INTRODUCTION

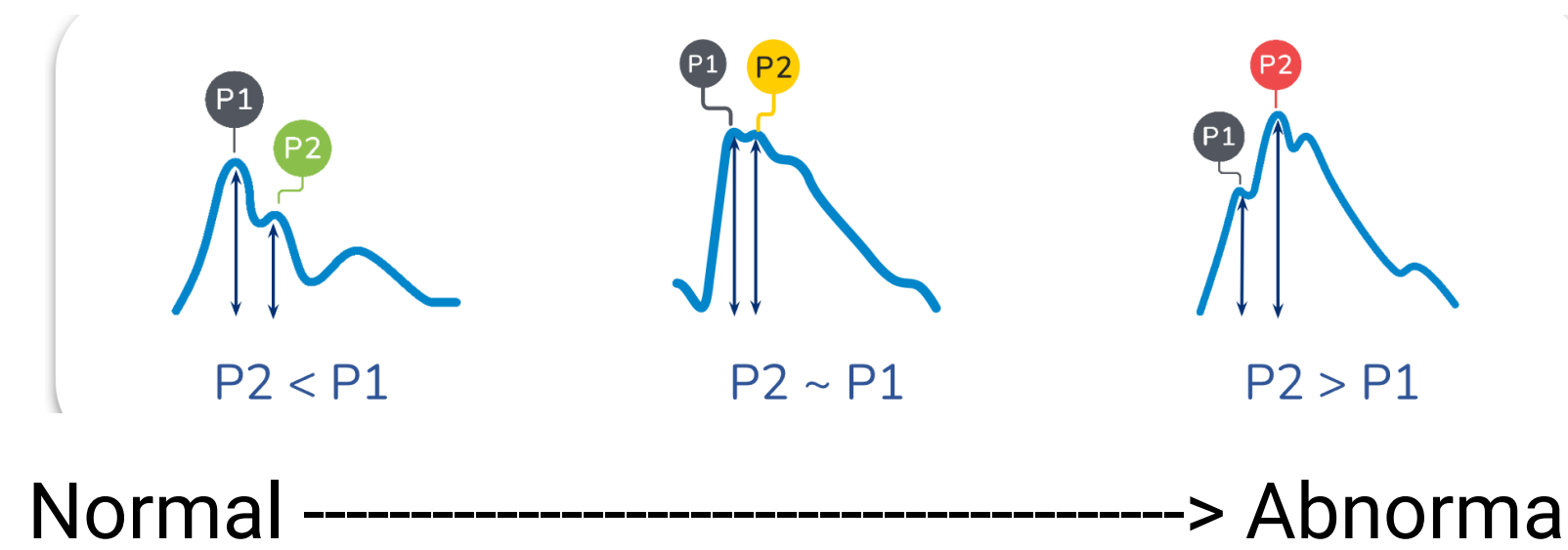
Brain4care (B4C) is a **non-invasive** device that monitors **intracranial pressure** (ICP). B4C captures tiny cranial expansions, which is transcribed into a surrogate ICP waveform. This waveform can be broken up into three peaks: P1, P2, and P3.

- A greater **P2/P1 ratio** indicates decreased intracranial compliance and rising ICP values.



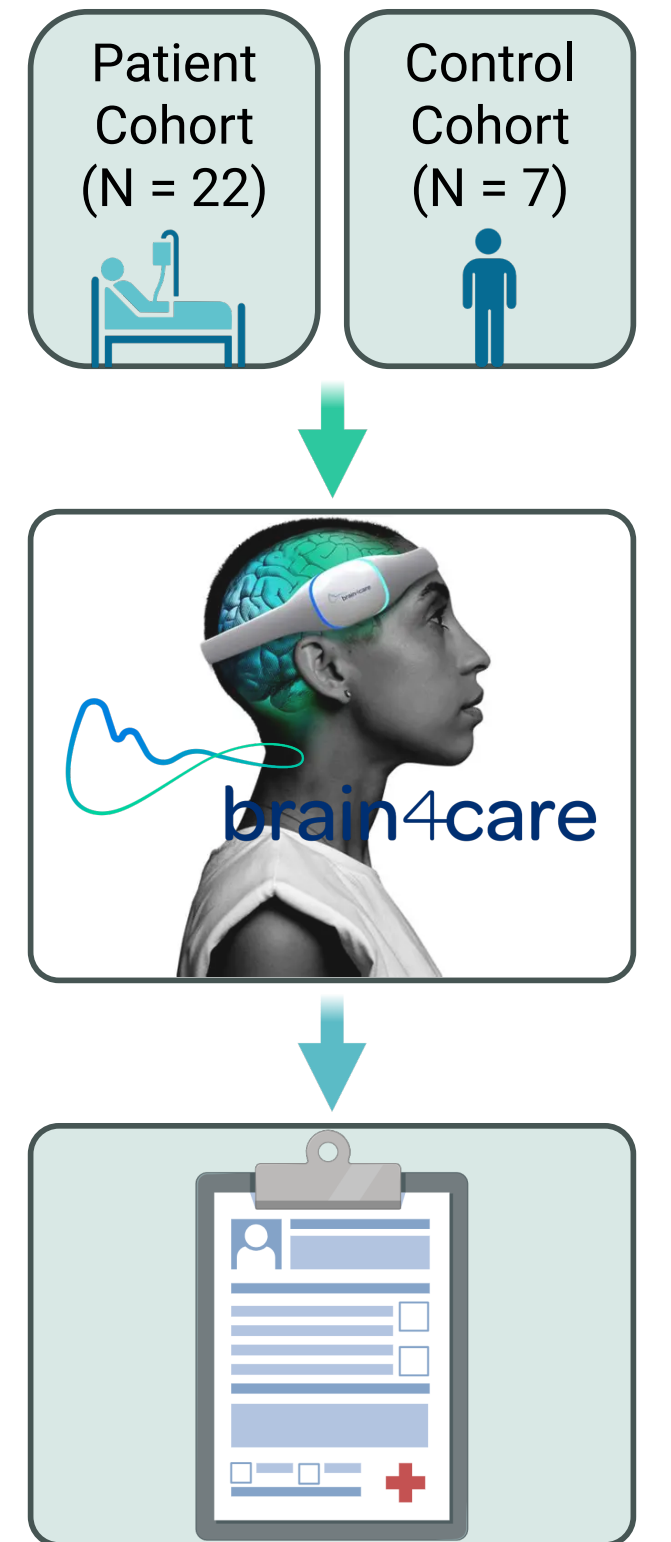
OBJECTIVE

This study aims to evaluate the **lateral differences** of P2/P1 ratios in neurocritical patients with unilateral brain injury.



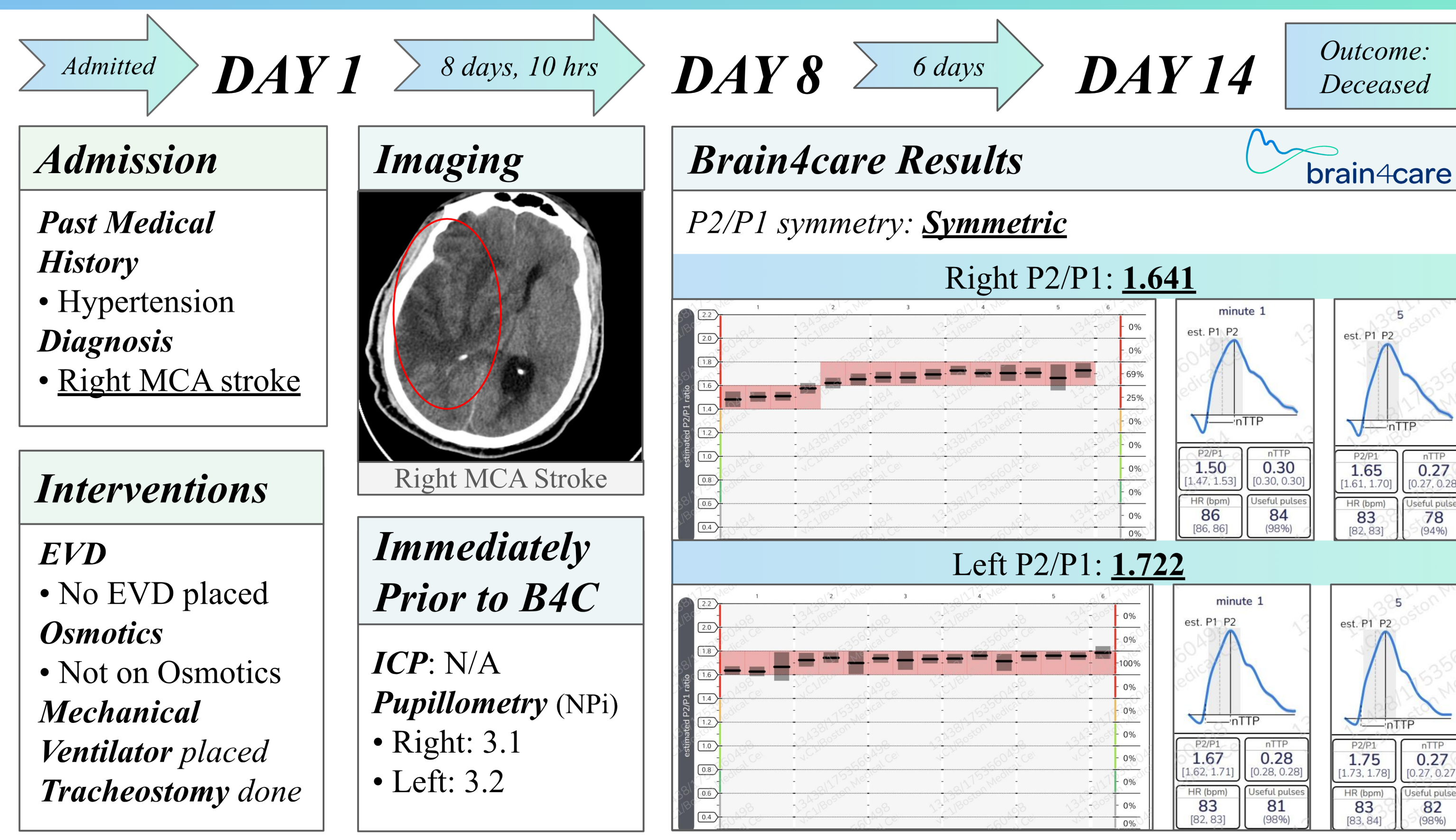
METHODS

- We conducted B4C on **22 eligible patients** in the Boston Medical Center Neurologic Intensive Care Unit and on **seven healthy adult controls**.
- We fastened the B4C headband sensor on the temple area of the skull and recorded five minutes of data per side.
- Using B4C report data, we then created **case studies** to analyze possible explanations for lateral asymmetry in P2/P1 ratios.

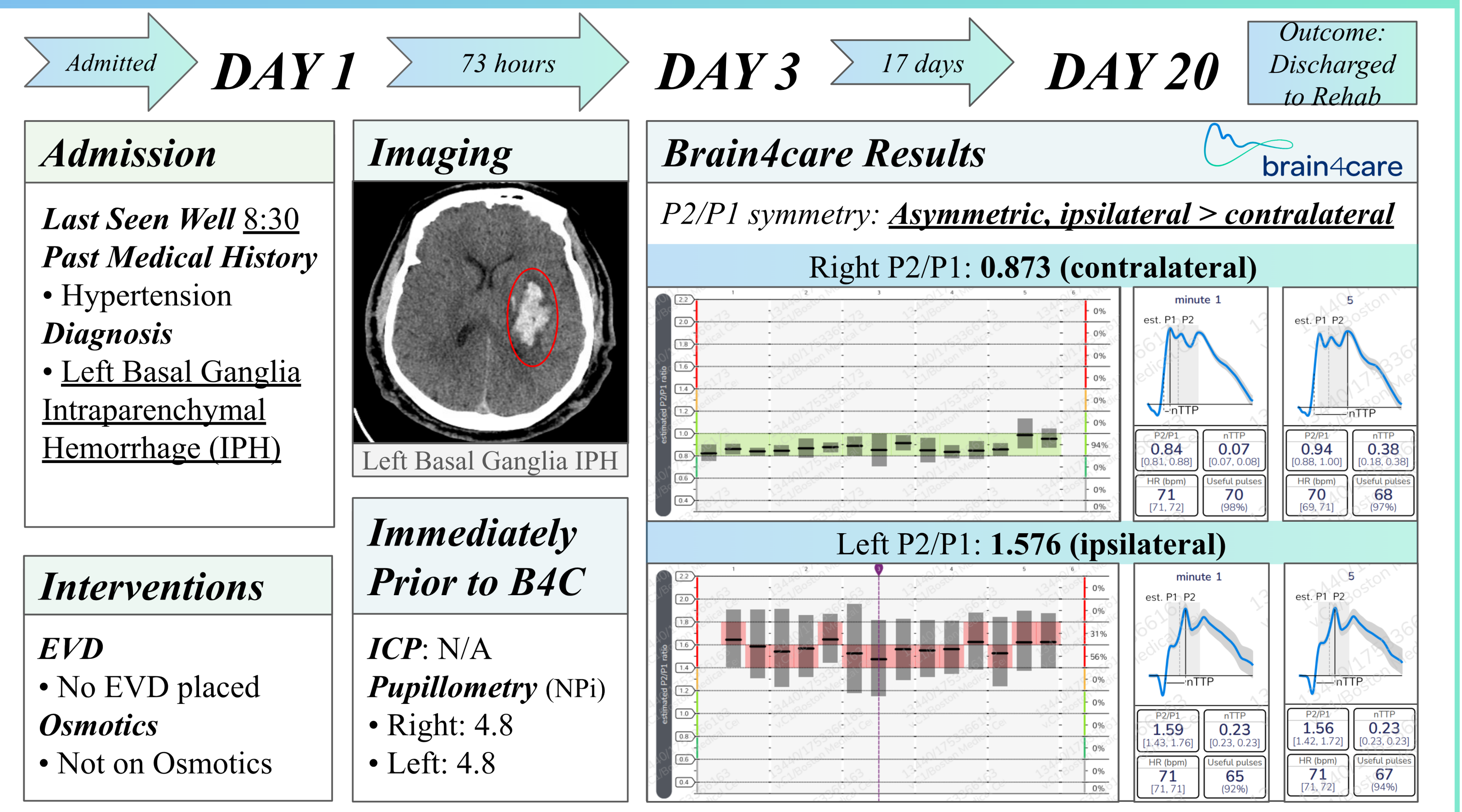


RESULTS: MINI CASE STUDIES

Brain4care Case Study: Lateral Symmetry



Brain4care Case Study: Lateral Asymmetry

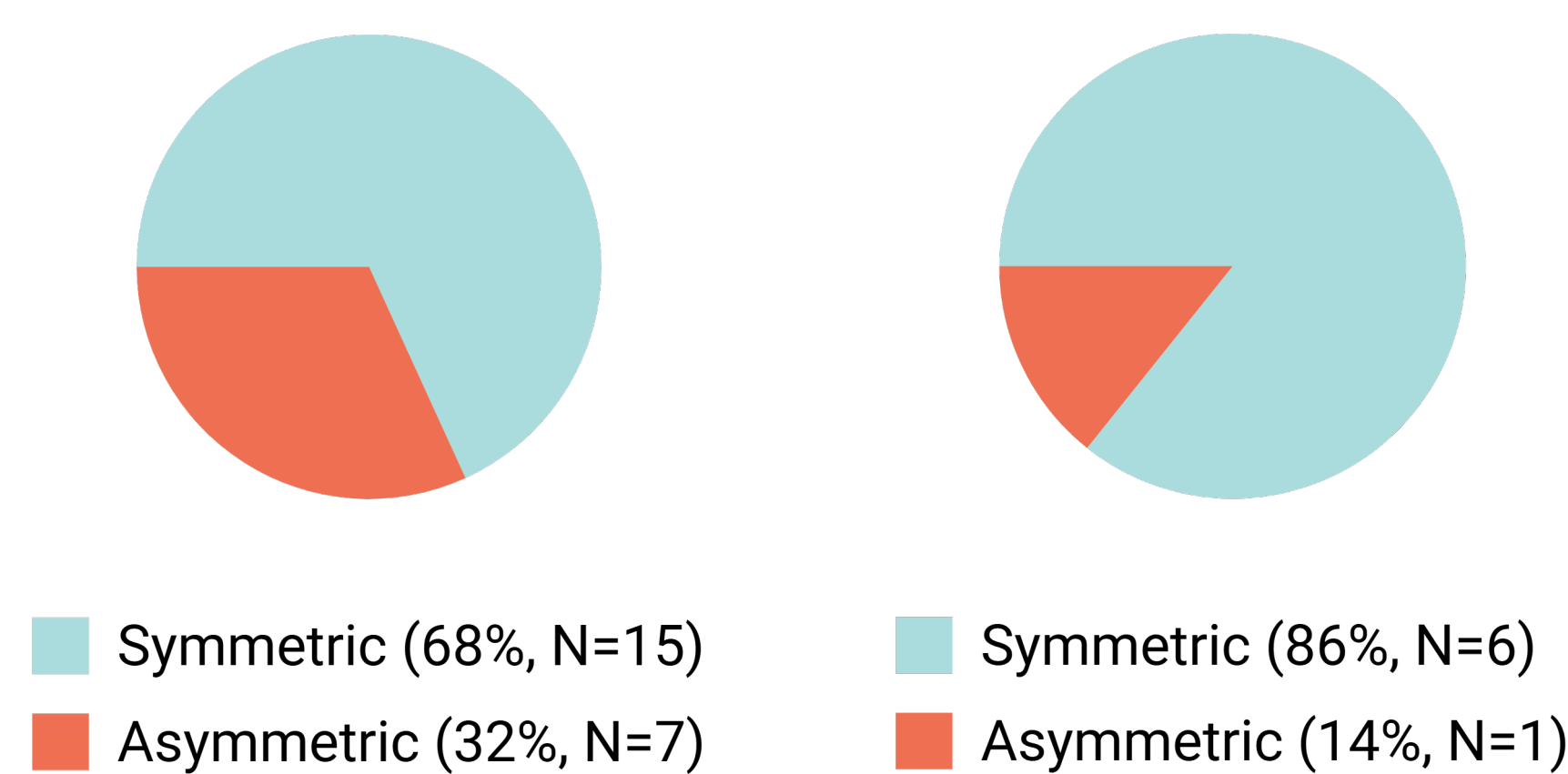


RESULTS: STATISTICS

Symmetry of Patient and Control Cohort

We defined **lateral asymmetry** as when P2/P1 ratios were one standard deviation outside of the normal P2/P1 range.

Patient Cohort (N = 22) Control Cohort (N = 7)

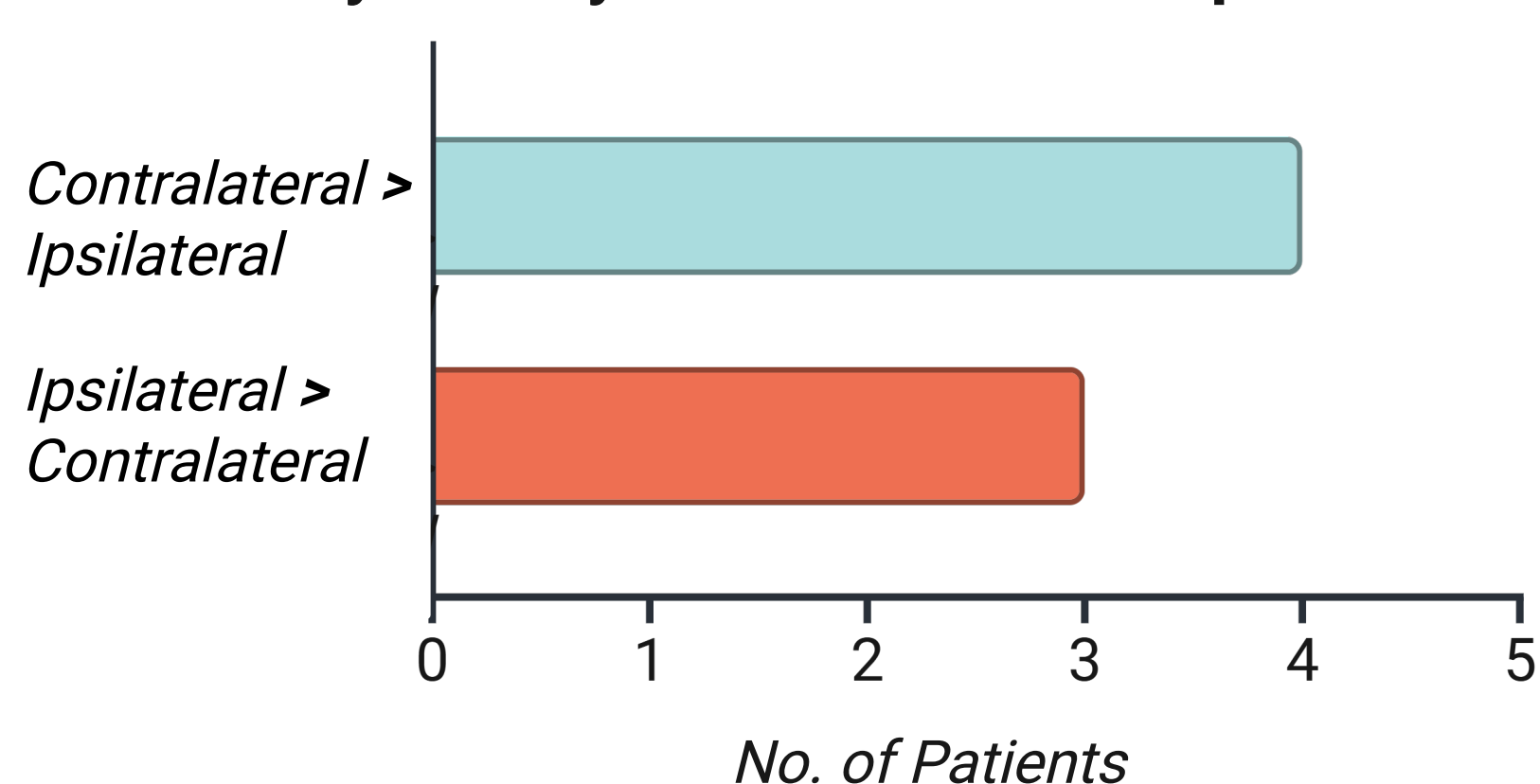


Patient Characteristics Table

	Variable	Symmetrical	Asymmetrical	Total
Demo-graphics	Age (avg, in years)	62.6	55.42	60.32
	Sex (female)	8 (53.3%)	4 (57.1%)	12 (54.5%)
Injury type	Acute Ischemic Stroke	3 (20.0%)	4 (57.1%)	7 (31.8%)
	Intraparenchymal Hemorrhage	4 (26.7%)	2 (28.6%)	5 (22.7%)
	Subarachnoid Hemorrhage	7 (4.67%)	0 (0.0%)	7 (31.8%)
	Traumatic Brain Injury	2 (13.3%)	1 (14.3%)	3 (13.6%)
Injury Laterality	Injury Laterality (left)	8 (53.3%)	6 (85.7%)	14 (63.6%)
Medication	Administered Osmotics	9 (60.0%)	6 (85.7%)	15 (68.2%)

Most notably, **85.7%** of patients with lateral asymmetry had a brain injury on the **left**, in comparison to only **53.3%** of patients with symmetric P2/P1 values. Left sided strokes are normally more common than right sided ones, but **there are notably far greater left hemispheric strokes in the asymmetric values population.** Our findings suggest that asymmetric P2/P1 values may be linked to injury laterality.

Lateral Asymmetry: Contralateral vs. Ipsilateral



CONCLUSION

Brain4care is an important non-invasive tool that helps dynamically monitor patients. Understanding the lateral differences of P2/P1 ratios and their associations is crucial to making timely clinical decisions.

We plan to expand our analysis to include a **broader range of brain injury populations** to identify P2/P1 waveform markers associated with different injury types. Our goal is to enhance the **interpretability** of our findings and increase their **relevance** across diverse clinical contexts.

ACKNOWLEDGEMENTS

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