

# Neurosurgical Network in Sarawak State: A Solution for Remote Urgent Pediatric Patients

Pei Meng NG<sup>1</sup>, Peh Hueh LOW<sup>3</sup>, Pei Ting HENG<sup>1</sup>, Nelson Kok Bing YAP<sup>2</sup>, Manvinder Singh MANGAT<sup>3</sup>, Donald Ngian San LIEW<sup>1</sup>, Albert Sii Hieng WONG<sup>1</sup>

<sup>1</sup>Department of Neurosurgery, Sarawak General Hospital, Kuching, Sarawak, Malaysia

<sup>2</sup>Department of Neurosurgery, Sibul Hospital, Sibul, Sarawak, Malaysia

<sup>3</sup>Neurosurgical Unit, Miri Hospital, Miri, Sarawak, Malaysia



## INTRODUCTION

- Pediatric neurosurgical emergencies require urgent surgery to prevent death or neurological deficit.
- Sarawak's unique geographical situation poses significant logistic challenges to patients requiring timely intervention.
- A neurosurgical framework has been established to overcome this obstacle.
- We aim to explore the impact of this network on children with acute neurosurgical conditions.

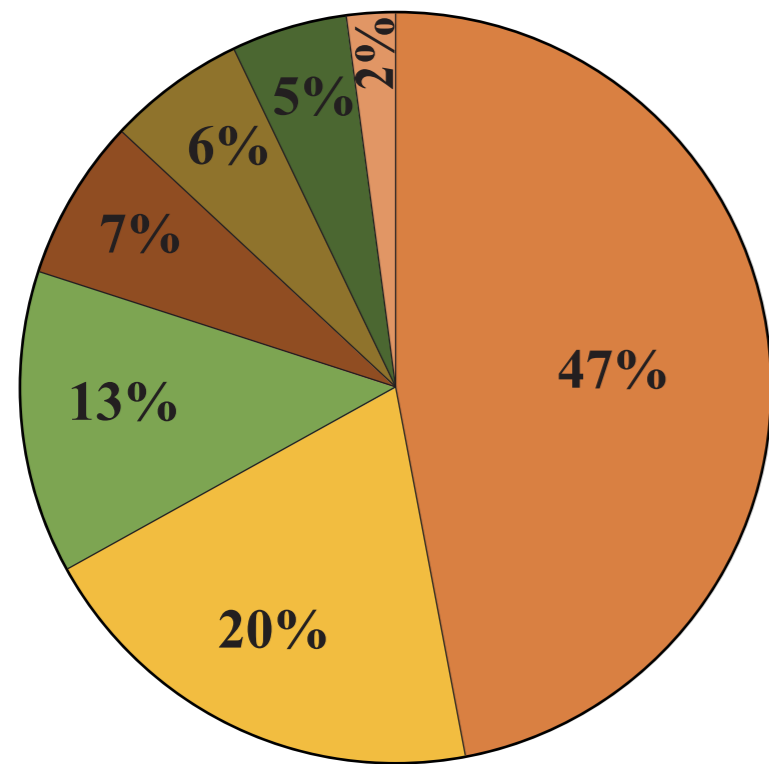
## METHODS

- Once there was only one neurosurgical center in the state at Kuching. To facilitate distant populations accessing neurosurgical care, neurosurgeons were placed in centers that do not normally offer neurosurgery: Sibul Hospital (since 2013) and Miri Hospital (since 2018).
- A retrospective review of children operated in all three centers from January 2019 to December 2021 was performed.
- We examined the diagnosis, distribution of cases, nature, and types of surgery performed.

## RESULTS

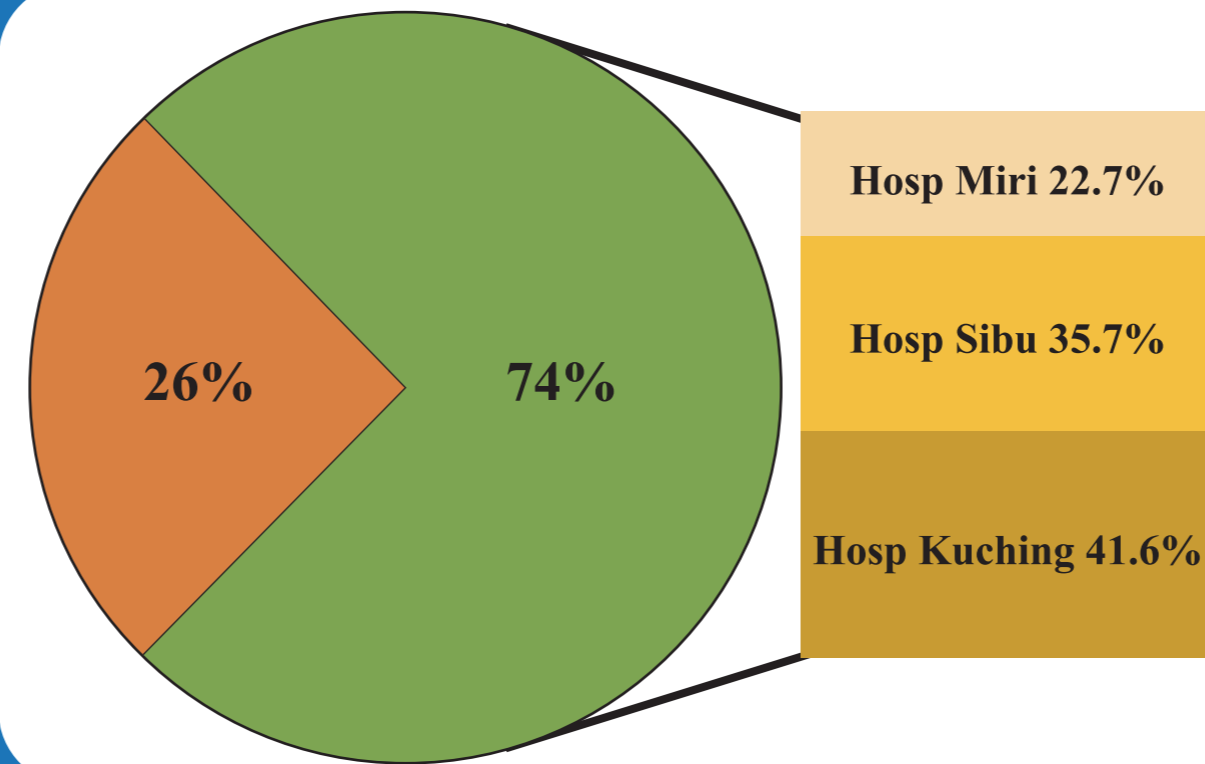
N = 526

Pathology



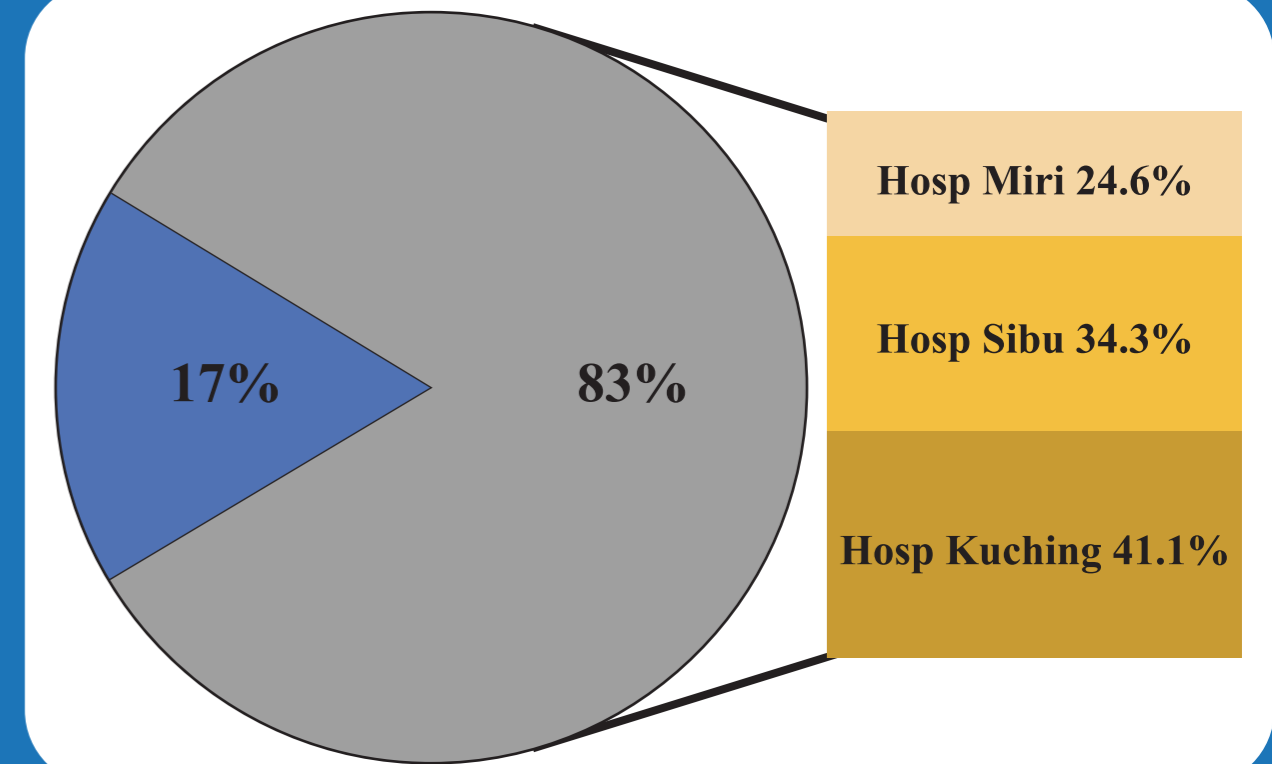
Hydrocephalus Trauma Tumors CNS Infection  
Congenital Vascular Others

Elective Vs Emergency Surgery



Elective Surgery Emergency Surgery

Analysis of Hydrocephalus Cases Only

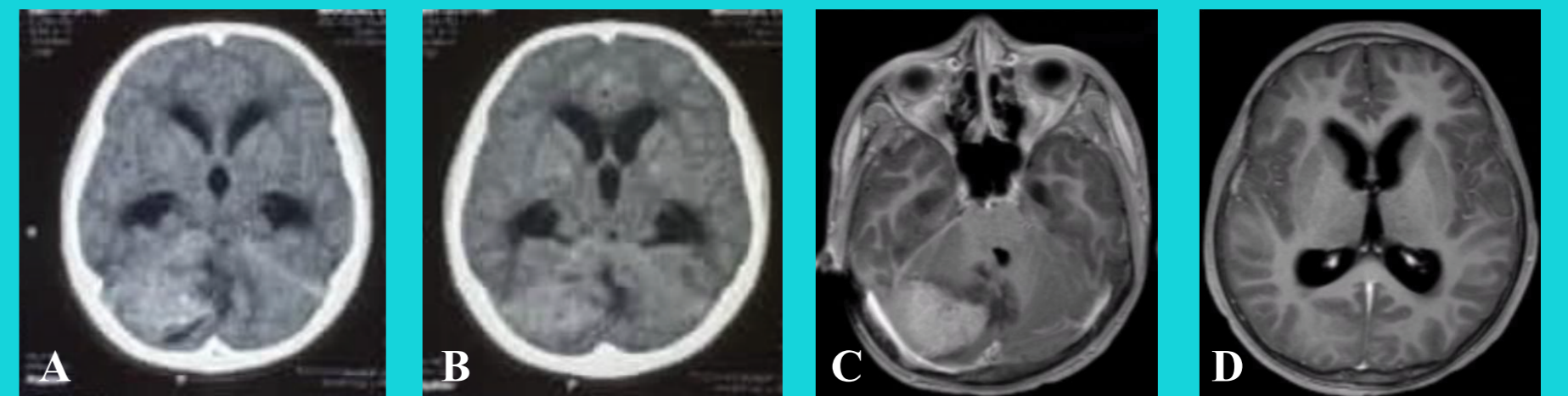


Elective Surgery Emergency Surgery

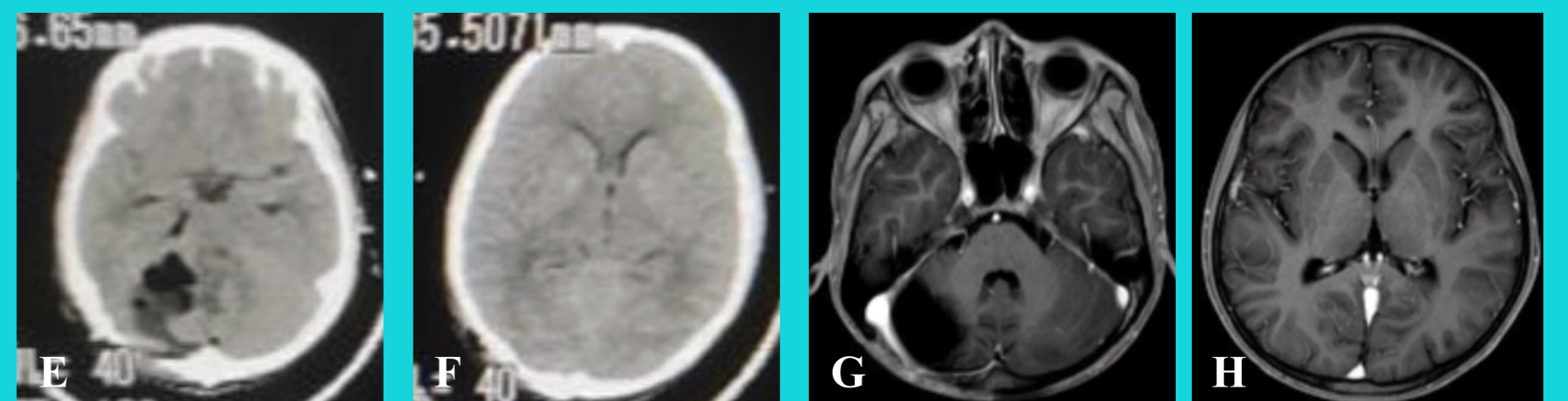
## CASE ILLUSTRATION

- A 13-year-old Penan boy from Long Napir.
- He presented with acute headache & vomiting. He was brought to Hospital Limbang. GCS was full on arrival with the presence of cerebellar signs.
- CT brain (Fig A, B) showed right cerebellar tumoral bleed with obstructive hydrocephalus. He was transferred to Miri General Hospital (MGH).
- On arrival at MGH, his GCS dropped to 7/15. An emergency external ventricular drain was inserted. His GCS subsequently improved.
- MRI brain was done the next morning, followed by craniotomy and tumor excision.
- Histopathological diagnosis showed medulloblastoma.
- During the last clinic visit, he was well with full GCS and self-ambulatory.

Preoperative images demonstrate obstructive hydrocephalus by posterior fossa tumor.



Postoperative images confirmed a gross total resection of tumor with resolved hydrocephalus.



## DISCUSSION

- Previously, patients traveled 402 km (6 hours by land) from Sibul, or 798 km (13 hours by land) from Miri to access neurosurgical services in Kuching. Distance & time to access neurosurgery were significantly reduced with the availability of neurosurgical services in Sibul and Miri.<sup>1,2</sup>
- Forty emergency surgeries for hydrocephalus in those centers were due to shunt malfunction. Troubleshooting shunt failure in children with shunt dependence is time-critical and challenging. This network allowed direct evaluation by trained personnel.
- Patients come from different socio-cultural and socio-economic backgrounds. They should have the same opportunities to access surgical treatment regardless of their geographical location, income, ethnicity, culture, or educational background.<sup>3</sup>
- The patient in the illustrated case from a rural area in the northern zone of Sarawak. His journey to the nearest neurosurgical center was 16 hrs. He had to pass through the immigration checkpoint at Brunei, which was closed during the COVID pandemic when this case occurred. This imposed an additional barrier to the transfer. If the current neurosurgical network was not in place, he would have to travel another 12 hrs to Kuching.



## CONCLUSION

The proportion of children requiring acute neurosurgery in Sarawak is high. The neurosurgical network in place shortens travel distance and time to surgery, allows timely evaluation by trained personnel, and promotes equity in accessing essential neurosurgery.

## REFERENCES

1. Heng, Yu Wei, et al. "Review of Neurosurgical Services in a Rural Area of Sarawak, Malaysia: The Benefits, Prospects and Challenges." *Interdisciplinary Neurosurgery* (2022): 101490.
2. Low, Peh Hueh, et al. "Neurosurgical services in the northern zone of Sarawak in Malaysia: the way forward amid the COVID-19 pandemic." *World neurosurgery* 144 (2020): e710-e713.
3. Liburd, Leandris C., et al. "Addressing health equity in public health practice: frameworks, promising strategies, and measurement considerations." *Annual Review of Public Health* 41 (2020): 417-432.