

Intraventricular Haemorrhage and Post-Haemorrhagic Hydrocephalus Management in Newborn Intensive Care Unit (NICU)

Guideline Responsibilities and Authorisation

Department Responsible for Guideline	NICU
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Target Audience	SMO, Registrars, Nurse Practitioners, Clinical Nurse Specialists, Registered Nurses, Enrolled Nurses
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Guideline Review History

Version	Updated by	Date Updated	Summary of Changes
01	Marisa Pacella	April 2022	First version

Intraventricular Haemorrhage and Post-Haemorrhagic Hydrocephalus Management in Newborn Intensive Care Unit (NICU)

1 Overview

1.1 Purpose

To diagnose and manage intraventricular haemorrhage and post-haemorrhagic hydrocephalus.

1.2 Scope

Waikato District Health Board (DHB) medical and registered nursing staff in NICU.

1.3 Patient group

Very Low Birth Weight (<1500 g) neonates and/or gestational age < 32 weeks, until discharge

1.4 Definitions

AHW	Anterior horn width
BW	Birth Weight
EVD	External ventricular drain
HUSS	Head ultrasound scan
IVH	Intraventricular haemorrhage
MRI	Magnetic Resonance Imaging
PHH	Post-haemorrhagic hydrocephalus
PVL	Periventricular Leukomalacia
VI	Ventricular index
VLBW	Very Low Birth Weight
VP	Ventriculoperitoneal shunt

2 Clinical Management

2.1 Screening for IVH

- **Early HUSS – Optional.**
 - Consider if it is likely to impact clinical decision-making such as unexplained decrease in haemoglobin, hypotension, or concern for life-threatening deterioration. Do not routinely perform as minimal handling is recommended for VLBW patients who are <72 hours of life.
- **Day 5 – Routine HUSS.**
 - Performed for all neonates <32 weeks gestation or <1500 g BW.

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- In the stable neonate, it is acceptable to wait up to 7 days of age.
- Consider HUSS for >1500 g or >32 weeks if clinically unstable (e.g. coagulopathic, unexplained anaemia, or neurologic symptoms). Consider HUSS if gestational age is unknown.
- **Week 6 – Routine HUSS.**
 - Performed for resolution of IVH and detection of PVL.
- **Term-corrected – A third HUSS (or MRI) is recommended at 36-40 weeks (Guillot 2020, Hand 2020) if:**
 - <1000 g BW
 - abnormal previous scan (grade 3+ IVH, PVL, ventriculomegaly)
 - significantly unstable NICU course

2.2 Follow-up HUSS for Abnormal Findings

- For grade 2 IVH or greater, an interval HUSS is recommended in 1-2 weeks. The purpose is to monitor for PHH. ([IVH classification](#))
- If any scans show ventricular dilatation:
 - Perform interval scans until ventricle size stabilizes and decreases.
 - Perform twice weekly head circumferences. Increased head circumference is a LATE sign of hydrocephalus.

3 Post-haemorrhagic Hydrocephalus

3.1 Definition

IVH can lead to non-communicating or communicating PHH. PHH can be defined using a ventricular index (VI) >97th percentile (or 2 S.D. +4mm) or anterior horn width (AHW) > 10 mm (see Section 6. Appendix A & B).

3.2 Refer

Discuss any patient that meets the definition of PHH with Neurosurgery.

3.3 Treatment

There is no consensus regarding early vs conservative treatment for PHH based on meta-analysis/systematic review. Early interventions (serial lumbar punctures or ventricular taps) may be considered if infant is too small for a definitive VP shunt. Conservative management is valid and commonly used due to the lack of proven benefit and the risk of harm of early interventions. One small RCT showed lower odds of death/disability in the early intervention group (Cizmeci 2020).

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Lumbar puncture or ventricular tap

– If VI or AHW is severe and increasing over time, neurosurgery or the neonatal Senior Medical Officer (SMO) may decide to perform serial taps. Remove no more than 10 mL/kg of CSF q24 hr. Send CSF for cell count and culture.

Ventriculoperitoneal (VP) shunt (or external ventricular drain EVD)

– per Neurosurgery

4 Audit Indicators

- Quarterly comparisons of IVH rates - Australian and New Zealand Neonatal Network (ANZNN)
- Annual review of PHH cases – both those that did and did not required VP shunt

5 Evidence base

5.1 References

- Cizmeci MN et al. (2020) Randomized controlled early versus late ventricular intervention study in posthemorrhagic ventricular dilatation: outcome at 2 years. *J Pediatr*, Vol 226, pp 28-35.
- de Vries LS et al. (2018) Treatment thresholds for intervention in posthaemorrhagic ventricular dilation: a randomised controlled trial. *Arch Dis Child Fetal Neonatal Ed.*, Vol 104, pp F70-F75.
- [Guillot M et al. \(2020\) Routine imaging of the preterm neonatal brain. *Paediatr Child Health*. 25\(4\): 249-255.](#)
- [Hand IL et al. \(2020\) Routine neuroimaging of the preterm brain. *Pediatrics*. 146\(5\): e2020029082.](#)
- Whitelaw A et al. (2017) Repeated lumbar or ventricular punctures in newborns with intraventricular haemorrhage. *Cochrane Database of Systemic Reviews*, <https://doi.org/10.1002/14651858.CD000216.pub2>.

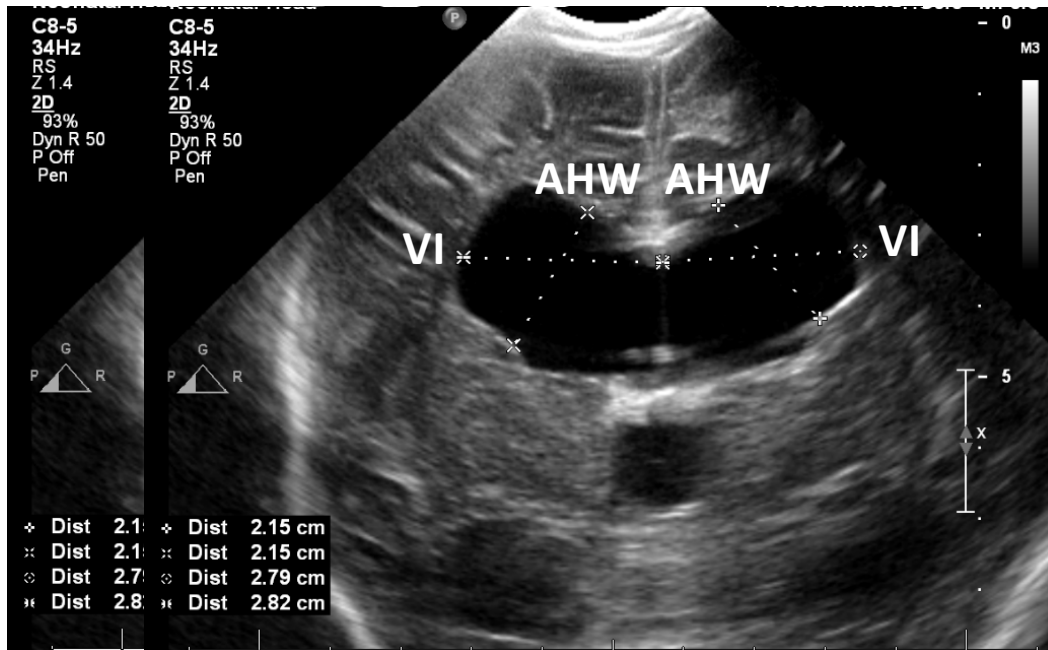
5.2 Associated Waikato DHB Documents

- Waikato DHB Medical Protocol: Extremely Low Birth Weight (ELBW) Bundle of Care for Prevention of Intra Ventricular Haemorrhage (IVH) (Ref. 6240)
- Lippincott Procedures: Shunt or reservoir care, neonate

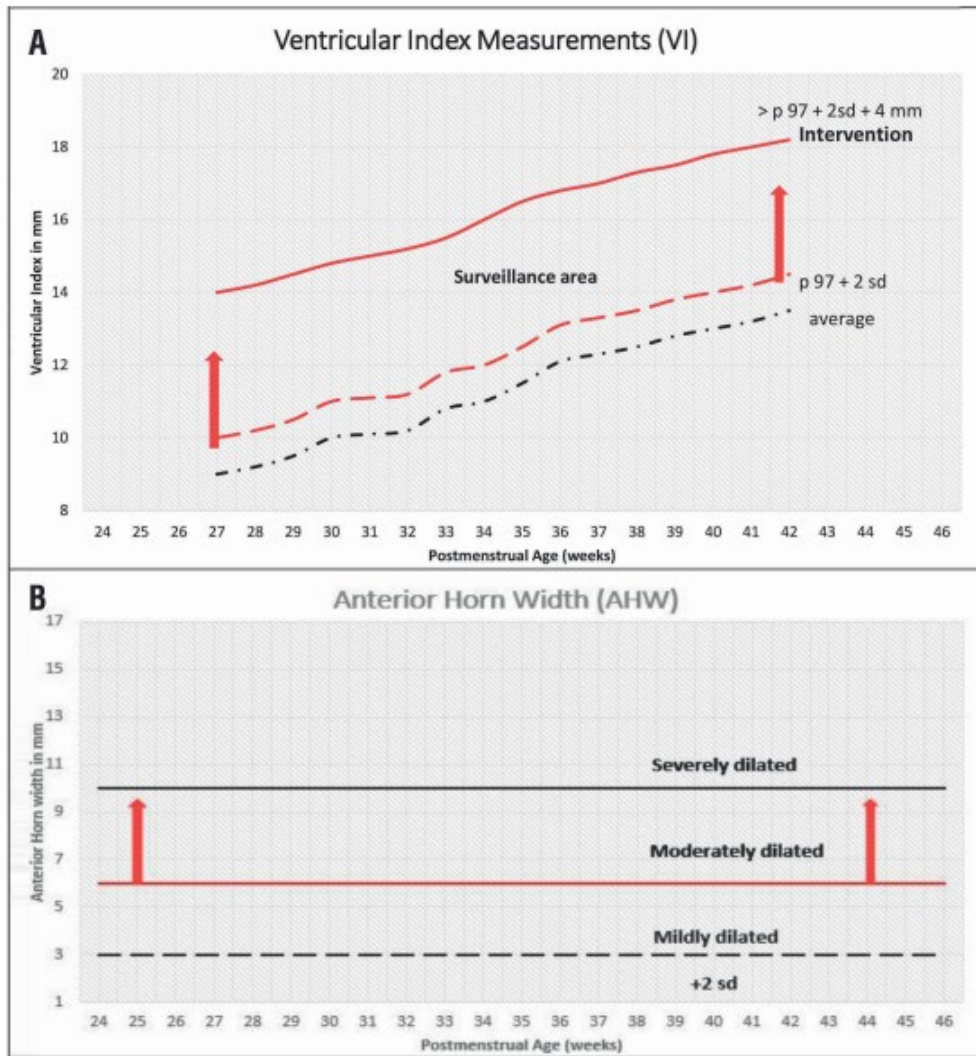
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Appendix A - Ventricular Index and B. Anterior Horn Width



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- 5A. Ventricular Index (VI) measured by ultrasound is plotted on the Levene Index where the black dashed line shows the average VI at each gestational age and the red dashed line indicates $p97\%ile + 2 \text{ sd}$, where surveillance for PHVD should begin and the solid red line indicating $p97\%ile + 2 \text{ sd} + 4 \text{ mm}$, where intervention is indicated.
- 5B. Anterior Horn Width (AHW) is measured by ultrasound and plotted on the Davies Graph, where the black dashed line indicates the minimum dilation of the ventricles, the red line indicates moderately dilated ventricles and the black solid line indicates severely dilated ventricles.

Note: Measurements of ventricular dilation, from Levene (1981) and Davies (2000).