Raised Intra-Cranial Pressure

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Intended Audience

This document contains information and clinical guidelines for management of children attending the Oncology and Haematology department. It is to be used by staff within the Trust whenever they are caring for these children either in hospital or at home.

Purpose

Assist staff in the recognition and management of raised intracranial pressure in Haematology and Oncology patients.

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1 Introduction

Raised intracranial pressure (ICP) may develop insidiously or present acutely as a result of a wide range of pathologies. In some children it will be a presenting feature of their malignancy whereas in others it may result from disease progression or treatment complications.

The problem arises because of interference with flow of cerebrospinal fluid, usually at level of 3rd or 4th ventricle (obstructive hydrocephalus), or compression of the cerebellum and brainstem, forcing them through the foramen magnum.

Potential causes of raised ICP include

- Brain tumour (primary or metastases)
- Intracranial haemorrhage
- Hydrocephalus (obstructive or communicating)
- Cerebral oedema e.g. post op or following radiotherapy
- Venous sinus thrombosis
- Shunt blockage
- Intracranial infection including fungal
- Hypertension
- Prolonged seizure

2 Diagnosis

The signs and symptoms of raised ICP vary with age. Classical symptoms include:

- Headache (classically morning headache present on waking), but headache waking from sleep is very suspicious
- Vomiting
- Change in behaviour or mood
- Ataxia or other motor disturbance
- Abnormal pupils
- New onset of squint
- Seizures

However as mild or chronically raised ICP may produce subtle signs it is important to have a high index of suspicion and take a thorough history in children at risk.

More severely raised ICP can be diagnosed according to the following criteria.

Either

- Papilloedema (late sign) in the presence of any decrease in conscious level

Or 2 or more of

- Conscious level reduced to GCS ≤8 (or Unresponsive on the AVPU scale)
- Abnormal respiratory pattern (hyperventilation, irregular respirations or apnoeas)
- Abnormal pupils (unilaterally or bilaterally dilated or unresponsive pupils)
- Abnormal posture (decorticate, decerebrate or complete flaccidity)
- Abnormal doll's eyes (oculocephalic) response

Cushing's response (bradycardia and hypertension) is seen as raised ICP progresses, due to impending herniation of the brainstem. It is a pre-terminal sign requiring immediate action.

3 Management

The immediate management of raised ICP is aimed at preventing further brain injury whilst the underlying cause is identified and definitive management instituted. Always discuss patient with Haematology/Oncology Consultant and Neurosurgeons.

- Assess and manage A, B, C
- Provide high flow oxygen
- Document GCS initially and frequently reassess (Appendix I)
- Check BM and capillary blood gas
- Tilt patient 20–30° head up
- Consider Mannitol 0.5 – 1.5g/kg (2.5 – 7.5ml/kg of 20% solution given IV through a 5 micron filter over 30 minutes). Maximum 1g/kg in children < 1 month
    - May be contraindicated in some patients – discuss before use
    - Mannitol is stored in the warming cupboard in Theatres
- Alternative is hypertonic sodium chloride – 3ml/kg of 3% sodium chloride over 10 – 20 minutes (or 2.7% sodium chloride if pre-prepared bag available – still give 3mls/kg). Potential advantages include preservation of intravascular volume (vs. diuretic effect of mannitol) and is reno-protective (mannitol can cause renal failure in oliguric patients). Care must be taken when preparing infusion and the correct amount of 3% solution must always be drawn up and delivered from via a syringe driver. NEVER attach a bag of hypertonic sodium chloride directly to a patient – severe hypernatraemia may result from inadvertent overdose.
- Consider IV Dexamethasone (as bolus or short infusion)
    - Doses as per BNFc recommendations for Life Threatening Cerebral Oedema
- Prescribe antibiotics +/- antifungals if any suspicion of infection
- Request platelets for transfusion if any possibility of thrombocytopenia
- Ensure any IV maintenance fluids are not hypotonic, i.e. use 0.9% sodium chloride initially

Early liaison with PICU is needed if GCS <13 or if there is progressive deterioration. The patient may require sedation and ventilation to control $PaCO_2$ and protect their airway as well as consideration for invasive blood pressure and ICP monitoring.

Urgent CT/MRI scanning is needed once patient is stabilised. This may provide additional information regarding underlying cause and direct further management. CT is preferable to MRI to diagnose haemorrhagic cerebrovascular accident. MRI may subsequently be required to define ischaemia in presence of possible thrombotic CVA.

<u>Do Not</u> Perform LP if Any Suspicion of Raised ICP

4. References and Further Reading

Oncologic Emergencies in Principles and Practice of Pediatric Oncology. Eds Pizzo and Poplack, 8th edition. Reviewed 19/7/22)

The Paediatric Accident and Emergency Research Group. The Management of a Child with a Decreased Conscious Level - An evidence-based guideline (2006) www.nottingham.ac.uk/paediatric-guideline (Accessed 22/3/22)

. The management of children presenting with decreased conscious level. Royal College of Paediatrics and Child Health. 2015 (updated 2019). Reviewed 19/7/22

J Pediatr Neurosci. 2014 Sep-Dec; 9(3): 207–215. doi: 10.4103/1817-1745.147572 (accessed 22/3/22)

Decreased Conscious Level in a Child – RCEMLearning Decreased Conscious Level in a Child - RCEMLearning (Online – accessed 22/3/22)

Appendix I

Glasgow Coma Scale

Best Motor response	6 = Responds to commands
	5 = Localises pain
(May be unilateral)	4 = Withdraws from pain
	3 = Abnormal flexion to pain (Decorticate)
	2 = Abnormal extension to pain (Decerebrate)
	1 = None
Eye opening	4 = Spontaneous
	3 = To speech
	2 = To pain
	1 = None
Best verbal response	5 = Fully orientated
	4 = Appropriate words but confused
	3 = Inappropriate words
	2 = Incomprehensible sounds
	1 = None

Score = Best motor response + eye opening + best verbal response

Maximum score = 15 Minimum = 3

Modified Glasgow Coma Scale for Children (use aged <5 Years)

Best Motor response	6 = Responds to commands/Normal spontaneous movement
	5 = Localises pain
(May be unilateral)	4 = Withdraws from pain
	3 = Abnormal flexion to pain (Decorticate)
	2 = Abnormal extension to pain (Decerebrate)
	1 = None
Eye opening	4 = Spontaneous
	3 = To speech
	2 = To pain
	1 = None
Best verbal response	5 = Alert, babbles, coos, words or sentences to usual ability
	4 = Less than usual ability/spontaneous irritable cry
	3 = Cries inappropriately
	2 = Occasionally whimpers/moans
	1 = None