

LRI Children's Hospital

Raised Intracranial Pressure in Children

Staff relevant to:	Medical and nursing staff working within UHL Children's Hospital
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1. Introduction and Who Guideline applies to

Raised intracranial pressure (ICP) is a potentially serious complication of traumatic brain injury. It can also occur as a complication of CNS infection, CNS tumour, hydrocephalus, hepatic encephalopathy, severe hypertension, intracranial bleeding from arteriovenous malformation or impaired intracranial venous drainage.

Prompt and early recognition of raised ICP is very important and management should concentrate in lowering intracranial pressure as well as treating the underlying cause in order to avoid serious neurological sequelae or death.

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2. Management

Is raised intracranial pressure suspected?

From History:

- Symptoms of meningitis or encephalitis
- Hypoxic ischaemic injury the brain (e.g. Post cardiac arrest)
- Metabolic (DKA, inborn errors)
- Blocked shunt in hydrocephalus
- Unexplained headache, vomiting, double vision/visual impairment
- Traumatic brain injury (NAI, accidental)

From clinical exam:

- Relative bradycardia with hypertension
- Focal neurological signs
- Bulging fontanelle in very young infant
- Abnormal posture
- Unequal pupils, dilated or poorly responsive
- Abnormal eye movement/ persistent eye deviation
- Seizures
- Reduced GCS ≤ 8
- Papilloedema (late sign)

Do not hesitate to start early treatment Start your management early without delay
No lumbar puncture

IMMEDIATELY:

- **Start resuscitation, ABC approach**
- **Don't forget glucose, treat hypoglycaemia promptly and avoid hyperglycaemia**
- **Give 3mls/kg of 2.7% sodium chloride or Mannitol (1gram/kg (5ml/kg) of 20% Mannitol over 15-30 minutes)**
- **Treat shock if present cautiously, avoid hypotension, if present treat aggressively**
- **Maintain a normal temperature, avoid hyperthermia**
- **Call for help**
- **Call anaesthetist early on**
- **Call CICU**
- **Elevate head to 30° in midline position**
- **Treat seizures if present, consider prophylactic treatment for seizures (Phenytoin)**
- **Urinary catheter**
- **Neuro observation every 15 minutes**

Neurointensive treatment:

- Ensure all the above measurement are considered
- Intubate and ventilate with tight control of PaCO₂ (4-4.5 KPa)
- Sedation pain control and muscle relaxation prior to transfer (Fentanyl, Morphine, Midazolam, Rocuronium...)
- Avoid neck line
- Treat hypotension aggressively
- Treat underlying cause accordingly
- **CT scan post stabilisation**

Hypertonic Saline

Administer 3 ml/kg over 5 – 15 minutes for signs of cerebral oedema or raised ICP. This dose can be repeated hourly until serum sodium levels reach 160 mmol/l. This is because hypertonic saline fails to reduce ICP if serum sodium levels are more than 160mmol/l. If signs of cerebral oedema/raised ICP persist, repeat hypertonic saline to maintain sodium 155-160mmol/l

If an “off the shelf” bag of 2.7% hypertonic saline is not available in your area a bag of 3% saline can be made up as follows. Dosing is exactly the same for 3% as for 2.7%.

- Remove 36 ml from a 500 ml bag of 0.9% sodium chloride add 36 ml of 30% sodium chloride.

Mannitol 20% (2g in 10ml):

Give 1g/kg (5ml/kg) 20% mannitol over 30 minutes. Repeat up to two times if needed. Repeat after 4-8 hours if required (only if serum osmolality < 310 mOsm/L). (20% Mannitol is stored in Windsor Childrens Fluid Store (near Wd 14), or C-PICU)

Sedation:

It is very important to keep patient well sedated, preferably with Fentanyl infusion to avoid hypotension that could potentially occur with Morphine infusion. If Morphine infusion is used please be aware of the possibility of hypotension and correct that promptly if needed.

Please note that therapeutic hyperventilation is reserved for cases with signs of acute cerebral herniation or raised ICP that does not respond to the above measures, in these circumstances please take advice from intensivist or consultant neurosurgeon as needed.

3. Education and Training

No new training is required to implement this guideline

4. Monitoring Compliance

What will be measured to monitor compliance	How will compliance be monitored	Monitoring Lead	Frequency	Reporting arrangements
Time to initiation of ICP protocol from identification of raised ICP	Retrospective notes Audit	Consultant	2 yearly	Clinical Audit Meeting

5. Supporting References

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6. Key Words

ICP, Raised intracranial pressure

The Trust recognises the diversity of the local community it serves. Our aim therefore is to provide a safe environment free from discrimination and treat all individuals fairly with dignity and appropriately according to their needs. As part of its development, this policy and its impact on equality have been reviewed and no detriment was identified.

CONTACT AND REVIEW DETAILS	
Guideline Lead (Name and Title) C Westrope - Consultant	Executive Lead Chief Medical Officer
Details of Changes made during review: <i>Feb 22 – added symptoms to history and Clinical Exam as per neurology</i> - <i>Added location of Mannitol storage</i>	