Guidelines for the Management of Raised Intracranial Pressure in Children and Young People with Malignancy
### Document Control

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<th>Title</th>
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#### Version Control

<table>
<thead>
<tr>
<th>Version/ Draft</th>
<th>Date</th>
<th>Revision summary</th>
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<tbody>
<tr>
<td>1</td>
<td>May 2009</td>
<td>First Published</td>
</tr>
<tr>
<td>2</td>
<td>Aug 2011</td>
<td>Revised and updated</td>
</tr>
<tr>
<td>3.0</td>
<td>Aug 2014</td>
<td>Revised and updated</td>
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#### Contributors to current version

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<th>Contributor</th>
<th>Author/Editor</th>
<th>Section/Contribution</th>
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<tr>
<td><strong>Publication date</strong></td>
<td>September 2014</td>
<td></td>
</tr>
<tr>
<td><strong>Review date</strong></td>
<td>August 2016</td>
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| **Proposed Target Audience for Consultation / Final Statement** | All consultations and e-mail notification of updated guidelines from the YHCYPCN Guidelines Group will be consulted to:  
YHCYPCN Network Group  
YHCYPCN Guidelines Group |
| **Proposed Circulation List for Final Statement** | All YHCYPCN guidelines will be made available electronically at [http://www.ycn.nhs.uk](http://www.ycn.nhs.uk). A link is also available from [www.hyccon.nhs.uk](http://www.hyccon.nhs.uk).  
No hard copies will be circulated by the Group. |
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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 may arise because of obstruction to the flow of CSF in hydrocephalus or mass effect from the tumour/bleed/infective pathology.

Potential causes of raised ICP include

- Brain tumour (primary or metastases)
- Leukaemia
- Intracranial haemorrhage
- Hydrocephalus (obstructive or communicating)
- Cerebral oedema e.g. post op or following radiotherapy or rapid biochemical changes with associated fluid shifts
- 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
- Headache that wakes patient from sleep is also very suspicious
- Vomiting
- Visual disturbance
- Change in behaviour or mood
- Fluctuating level of consciousness
- Ataxia or other motor disturbance
- Abnormal pupils (may be noted by relatives)
- 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.

Severely raised ICP is indicated by the following signs and symptoms

- Cushing’s response (bradycardia and hypertension)
  o This is a pre-terminal sign due to impending herniation of the brainstem requiring immediate action (neurosurgical review and likely scan).

- Papilloedema (late sign) in the presence of any decrease in conscious level
  o This constitutes an oncological emergency and immediate help should be sought with managing the patient.

- Sunsetting – eyes deviated medially and inferiorly
  o Signifies critically raised intracranial pressure. Requires immediate action (scan and neurosurgical review).

If any of the following are present, investigation and management (in conjunction with paediatric intensivists and neurosurgeons) as to the cause of the problem should be urgently undertaken:

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

Early liaison with PICU is needed if GCS <13 or if there is progressive deterioration. The patient may require sedation and ventilation to control PaCO2 and protect their airway as well as consideration for invasive blood pressure and ICP monitoring. If the patient will require transfer to another hospital then there needs to be early discussion with the Embrace transport team.

If patients observations are being recorded on PAWS charts then the appropriate version which includes neuro-observations must be used.

- Assess and manage A,B,C. Provide high flow oxygen
- Document GCS initially and frequently reassess (Appendix 1)
- Take blood for full blood count, clotting and electrolytes
- Check blood sugar and capillary blood gas. Manage glucose abnormalities.
- Take paired urine/blood sample for urgent assessment of osmolality. (This may help differentiate cause of the raised ICP. Will need telephone contact with biochemist on call.)
- Tilt patient 20–30° head up. Alert PICU to the presence of the patient.
- Consider stopping hyperhydration and change fluids to normal saline.
- Consider Mannitol if cause is likely to be related to head injury, intra-cranial bleed or fungal infection.
  - 0.25 g/kg IV over 30 minutes (via 5 micron filter) = 1.25 ml/kg of 20% solution.
  - May need to be repeated when transferred to PICU
  - May be contraindicated in some patients – discuss before use
- Consider IV Dexamethasone if cause is likely to be related to a space-occupying lesion. Contraindicated in fungal infection
  - 0.25-0.5/kg daily, given oral or IV
    - normal dose 0.25mg/kg;
    - 0.5mg/kg reserved for critically raised ICP
  - Taper after 3 days or as soon as clinically indicated (See BNFc)
- Prescribe antibiotics +/- antivirals +/- antifungals if any suspicion of infection
- Prescribe antipyretics if febrile
- Request platelets for transfusion if any possibility of thrombocytopenia
- Ensure IV maintenance fluids are not hypotonic, i.e. use 0.9% saline initially

Urgent CT scanning is needed once patient has been resuscitated and is stable. CT scanning cannot diagnose raised intracranial pressure, but may indicate the cause of the clinically defined problem. Discussion should be undertaken with the Radiologist regarding the potential benefit of contrast.

MRI may subsequently be required to define further the nature of any problem that has been identified. An out-of-hours MRI is occasionally necessary, and should be undertaken after discussion.

DO NOT PERFORM LP UNLESS A SCAN HAS EXCLUDED A BRAIN LESION (eg TUMOUR or BLOOD CLOT) AS THE CAUSE
Check with neurosurgery and radiology first if any doubt

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Guidelines for the Management of Intracranial Pressure in Children and Young People with Malignancy

3. Management

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4 References and Further Reading

Based on: Neurological Emergencies: Raised Intracranial Pressure, Sheffield Children’s Hospital Clinical Guidelines. D Yeomanson and M Gerrard, May 2008


5 APPENDIX I

GLASGOW COMA SCALE

Best Motor response
(May be unilateral)
6 = Responds to commands
5 = Localises pain
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
(May be unilateral)
6 = Responds to commands/Normal spontaneous movement
5 = Localises pain
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

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5. Appendix i

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