

Trust Guideline for the Management of Children with Hydrocephalus and Ventriculo-peritoneal Shunts

A clinical guideline recommended for use

In:	Accident and Emergency, Children's Assessment Unit and Buxton ward
By:	Medical staff
For:	Children with Ventriculo-peritoneal Shunts
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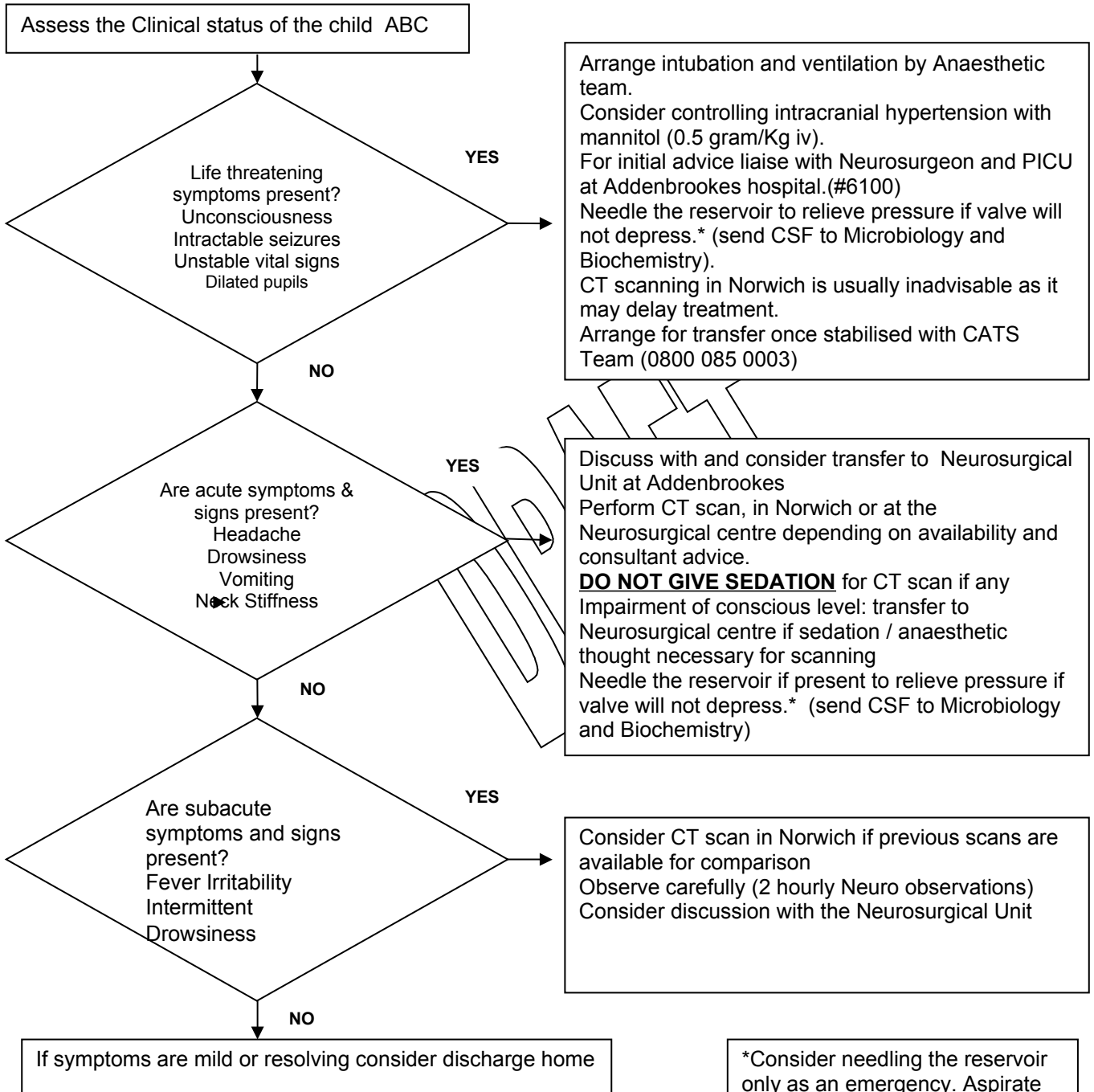
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Quick reference guideline

Hydrocephalus and possible shunt blockage



Remember:

**A shunt that ‘pumps’ normally can still be blocked.
A normal scan does not exclude shunt malfunction.
If in doubt seek Neurosurgical advice**

*Consider needling the reservoir only as an emergency. Aspirate 10mL/kg/min, please note that you may not be able to aspirate with ventricular shunt blockage.

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Objective/s

To give medical staff an outline of the management of a child with suspected blocked Ventriculo-peritoneal (V.P) shunt.

Rationale

This guideline provides advice for the management of children with possibly obstructed ventriculo-peritoneal (V.P) shunts. In the U.K (total population 60 million), the number of shunt operations is estimated at 3500-4000 per year by the U.K shunt registry.² Unfortunately shunts frequently fail due to infection and obstruction. Advice is given on managing these problems and when to seek further advice and management from Neurosurgeons.

Broad recommendations

The basic shunt structure comprises a short length of proximal ventricular tubing which leads from the ventricular cavity through the brain substance and through the skull to connect with a subcutaneous one way valve to control the drainage of CSF (preventing excessive drainage) and prevent back flow. From the valve a longer subcutaneous catheter is tunneled to the abdomen, where a small incision overlies the catheter, which is coiled in the peritoneum. Most shunt components are radio-opaque ensuring visibility on plain radiographs. The valve may be programmable, allowing programmability of opening and closing pressure, and if so the setting is changeable with an external magnet.⁶

Shunt complications

All shunts are prone to malfunction, 30% failing within 6 months of placement, 50% failing by 6 years and 70% by 12 years. (UK shunt registry, unpublished data 2005). Shunt malfunction may be the result of obstruction, infection, disconnection at the junction or break, hardware erosion through the skin and over shunting.⁶

Recognition of shunt complications

History

Recognition of shunt malfunction involves assessment of the patient as a whole and assessment of the shunt hardware. Shunt evaluation includes ascertaining the reason for initial shunt insertion (e.g. meningitis, tumour, myelomeningocele), documenting the date and reason for the last revision and the type of valve implanted (programmable/adjustable).

It is important to pay careful attention to the observations of families and carers. Watkins et al (1994) demonstrated that families were at least as accurate as paediatricians in diagnosing shunt block.⁸

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SYMPTOMS PROMPTING EVALUATION COMPARED WITH FINDINGS AT SURGERY.⁴

Symptom	Predictive value (%)
Headache	43
Vomiting	47
Lethargy	52
Fever	23
Irritability	54
Seizure	9
Other*	33

*Other symptoms include swelling and leakage at the shunt site, gait difficulty and ataxia, gaze paresis, visual loss, diplopia, abdominal pain and increasing head circumference. Because of the many symptoms grouped together in this category, the predictive value cannot be calculated.

Approximately 3-12% of patients develop shunt infection (Casey et al, 1997⁹). Shunt infection is suggested by fever (usually intermittent and low grade), rigors, headache, drowsiness, lethargy, anorexia, generalised malaise, irritability, vomiting, peritonism (ventriculo-peritoneal shunt), pleurisy (ventriculo-pleural shunt) and occasionally pain and erythema along the shunt device system.

Examination

Physical examination should include:

- ABC.
- Documenting Glasgow Coma Score.
- Visual acuity and field of vision.

Optic fundoscopy should be performed for papilloedema. The first definitive step involves locating and assessing the shunt.

SHUNT RESERVOIR PALPATION: INTERPRETING THE FINDINGS

1. The reservoir cannot be compressed - this suggests the distal shunt is obstructed. In a moribund child, raised intra-cranial pressure can be relieved by inserting a 25 –gauge butterfly needle into the bulb or ventricular access reservoir at an angle of 45⁰ to the skin under aseptic precautions.
2. The reservoir empties easily but remains collapsed or is collapsed at presentation - there may be an obstruction at the ventricular end of the shunt. Alternatively the

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child may have 'slit ventricle syndrome' from excessive drainage and / or inadequate production of CSF.

3. The shunt empties and refills readily - either the shunt is functioning normally or the valve has failed allowing seesaw movement of CSF.

In a stable patient, the entire length of the subcutaneous shunt should be inspected and palpated.

Investigations

FBC, U&E, CRP, Blood cultures and urinalysis.

CT scanning is useful to make the diagnosis if previous CT scans are available. There are however children who have high intracranial pressure despite normal sized ventricles. (9% of children with symptomatic ventriculo-peritoneal shunt malfunction lacked radiographic evidence of progressive ventricular dilatation). Patients with prior shunt infections are particularly at risk, necessitating increased vigilance when clinical signs and symptoms are apparent.⁷

An X-ray to demonstrate shunt functional integrity may be valuable if a broken or disconnected distal shunt is suspected. Some older shunts are not radio-opaque throughout their length so it can be confusing.

It is possible to diagnose majority of the ventricular shunt malfunctions without aspirating the shunt device.⁴

Definitive Management

Urgent neurosurgical consultation is recommended to prevent potential delays in treatment and to prevent devastating complications of shunt malfunction. If shunt infection is suspected, the neurosurgical team would ideally prefer to aspirate the shunt prior to starting antibiotics. If child is unwell and unstable, then start empirical antibiotics (ceftriaxone as it has good CSF penetration) after taking blood cultures.

Clinical audit standards

All children with a shunt blockage should be transferred to a tertiary hospital for further management.

Summary of development and consultation process undertaken before registration and dissemination

The authors listed above drafted this guideline on behalf of the Norfolk and Norwich University Hospital paediatric directorate who has agreed the final content. During its development it was presented at the departmental guideline meeting and has been circulated for comment to Miss Helen Fernandes (Consultant Neurosurgeon at Addenbrookes Hospital).

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This version has been endorsed by the Clinical Guidelines Assessment Panel.

Distribution list/ dissemination method

Trust intranet.

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