Paediatric Intensive Care Unit Nursing Procedure:
External Ventricular Drains (EVD).

Definition

An EVD is defined as a temporary method of treatment that allows excessive cerebrospinal fluid (CSF) to drain from the lateral ventricles of the brain to relieve any increase in intracranial pressure (ICP).[1]

Indications

- To monitor intraventricular pressure and output of CSF.
- To divert CSF that contains bacteria or blood.
- In the emergency treatment of a malfunctioning internal shunt and hydrocephalus.
- To control ventricular pressure.[2]

Insertion of EVD

Ensure that the child and family are adequately prepared for the procedure (age appropriate), why it is being performed and what it entails and then that their understanding is sufficient.
An EVD system involves inserting a soft catheter into one of the lateral ventricles through a small hole (burr hole) made in the skull. The catheter is then connected to an external drainage system. The small incision in the scalp is then sutured and covered with a sterile dressing. This procedure is carried out in an operating theatre.[3]

Care of patient with EVD	Rationale
• On return from theatre assess the patient's airway, breathing and circulation.[4]	• Patients should always be assessed in order of A, B and C according to APLS guidelines.[4]
• Assess patient's neurological observations post-operatively and at regular intervals (as requested by the neurosurgeons).[5] Report	• To gain a baseline set of neurological observations and to note quickly any deterioration in the patient's condition.

any deterioration in the patient's condition to the medical staff and nurse in charge immediately.	
• Check that all connections and tubing are secure and clearly label the drain as EVD.[3]	• To ensure there is no CSF leakage from the drainage system, and to avoid accidental removal.[3]
• Level the drainage system using a spirit level from the zero point on the drain (marked with a red bung) to the patient's external auditory meatus (or tragus).[2,3]	• This external point corresponds internally to the interventricular foramen of Munro which is located at the beginning of the third ventricle.[3] CSF is mainly produced in the lateral, third and fourth ventricles.[2]
• The height of the drip chamber must be adjusted until it is set at the level prescribed by the neurosurgeons before unclamping the system.[2,3]	• The difference in the height between the zero point and the drip chamber creates a pressure gradient and a safety valve. The height of the drip chamber corresponds to the ICP. This pressure must be reached before any CSF will drain into the drip chamber.[3]
• On shift handover check the patient's Glasgow Coma Scale (GCS) together and also check the height the EVD is set at and that it is leveled correctly and draining. Record this information on the relevant EVD shift handover form.	• This is to ensure that the EVD has been handed over correctly and ensure continuity of appropriate care.
• When moving and repositioning the patient, or for physiotherapy and suctioning, the drain should always be clamped prior to starting, and then re-zeroed after finishing before being unclamped again.[2,3] Drain should not be clamped for longer than an hour.[3]	• If the head is raised above the level of the EVD then CSF will 'siphon' out of the head reducing the ICP as the volume of CSF within the head has decreased. If the head is lower than the zero point then the ICP will need to increase before any CSF will drain.[3]
• Accurately monitor and document the amount of CSF drainage hourly.[3]	• The amount of CSF drained gives an indication of the patient's ICP. An increase in drainage could indicate a rise in ICP.[3]

• Inform the medical staff and nurse in charge, and discuss with neurosurgical team, if the volume is more than 10mls higher than previous hourly totals.[3] The average drainage for an infant is approx 5mls/hr, for a child approx 10mls/hr, and for an older child approx 15mls/hr.	• Excessive drainage may collapse the ventricles which could pull the brain from the dura, this may in turn lead to blood vessels in the dura becoming ruptured causing a subdural haematoma.[3]
• If there is minimal or no drainage check the tubing for kinks, blockages or closed stopcocks. If no obvious causes then check to see if the CSF is oscillating (this is done by lowering the set height briefly and seeing if the CSF is oscillating in the tubing). If there is a suspected blockage then contact the neurosurgeons immediately.[3]	• No drainage may indicate that the drain has become blocked. Reduced or no drainage may cause an increase in ICP or the redevelopment of hydrocephalus. If there is no drainage but the drain remains patent then the CSF in the tubing should be seen to swing or oscillate due to pulsatile pressures. 'Osc' should be recorded on the fluid chart to show that the drain is not blocked.[3]
• Observe the appearance of the CSF, document and report any changes to the medical staff and nurse in charge.[3]	• Bloodstained CSF would indicate blood within the ventricles. Frank blood could indicate a cerebral haemorrhage. Cloudy CSF could indicate an infection.[3]
• Artery forceps, gauze and alcowipes must be kept in the child's bedspace.[6]	• This is to ensure the system can be clamped and kept clean should it become accidentally disconnected.[6]
• Aseptic technique should be used at all times when handling the EVD. If the drain needs accessing for samples, administering antibiotics or requires flushing/aspirating due to blockage this should be performed by the neurosurgeons.[3]	• Aseptic technique should be used to minimize the risk of infection. The collection bag should be changed when ¾ full aseptically according to local policy.[3]

References

1. Gibson I (1995) Making sense of external ventricular drainage. *Nursing Times.* 91 (23); 34-5
2. Davies JH and Hassell LL (2001) *Children in Intensive Care: A Survival Guide.* Churchill Livingstone, Edinburgh

3. Woodward S, Addisin C, Shah S, Brennan F, MacLeod A and Clements M (2002) Benchmarking best practice for external ventricular drainage. *British Journal of Nursing.* 11 (1) 47-53
4. ALSG (2005) *Advanced Paediatric Life Support: The Practical Approach (4th ed).* Blackwell publishing, Oxford
5. National Institute for Health and Clinical Excellence (2007) *Head injury: triage, assessment, investigation and early management of head injury in infants, children and adults.* Clinical guideline 56, London.
6. *http://www.ich.ucl.ac.uk/clinical_guidelines/cpg_guideline_00069* / (accessed 30th October 2008)

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