NHS
Greater Glasgow and Clyde

CLINICAL GUIDELINE

External Ventricular Drain Management, Neurosurgery

A guideline is intended to assist healthcare professionals in the choice of disease-specific treatments.

Clinical judgement should be exercised on the applicability of any guideline, influenced by individual patient characteristics. Clinicians should be mindful of the potential for harmful polypharmacy and increased susceptibility to adverse drug reactions in patients with multiple morbidities or frailty.

If, after discussion with the patient or carer, there are good reasons for not following a guideline, it is good practice to record these and communicate them to others involved in the care of the patient.

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Important Note:

The Intranet version of this document is the only version that is maintained.
Any printed copies should therefore be viewed as 'Uncontrolled' and as such, may not necessarily contain the latest updates and amendments.

1.1 Definition/Purpose

This guideline provides evidence based clinical guidance to care for a patient with an External Ventricular Drain (EVD) and provide consistency in care delivery in a neurosurgical setting.

1.2 Introduction

The Monro-Kellie doctrine states that the skull, a rigid compartment is filled with essentially non-compressible contents- brain and interstitial fluid (80%), intravascular blood (10%) and cerebrospinal fluid (CSF, 10%) in the ventricles and subarachnoid space.

The sum of all these and other components (for example tumour, haematoma) is constant and there is a fine balance in maintaining CSF volume and intracranial pressure (ICP). When this balance is disturbed by formation, flow or absorption of CSF, there is an increase in CSF volume or hydrocephalus and intracranial hypertension. When ICP increases, neurological consequences may range from minor to severe including death. Zhang *et al* (2017) and Muralidharan, (2015)

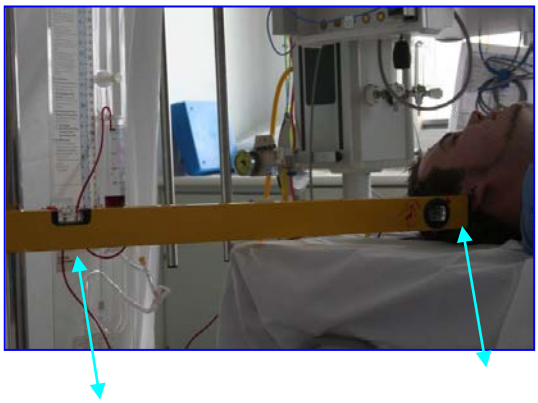
External ventricular drain (EVD) is defined as a temporary method of treatment that allows excessive CSF to drain from lateral ventricles of the brain to relieve any increase in ICP. An EVD system involves inserting a radiopaque catheter into one of the lateral ventricles through a burr hole made in the skull. This procedure is

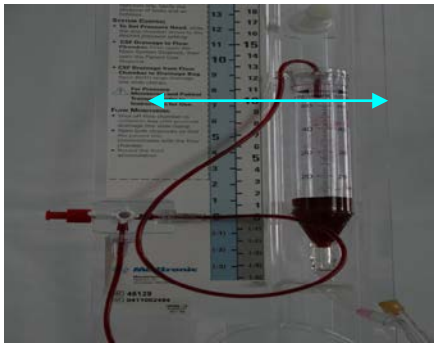
undertaken by a Neurosurgeon usually in the operating theatre. This catheter is connected to an external drainage system which is then zeroed to the patient. The point of reference used to zero the system is the external auditory meatus. The drip chamber collecting CSF can be moved up or down against the zero reference level according to the Neurosurgeon's instruction. Nursing management of patients with EVD encompasses both the physical management of the drainage system and the specific needs of the patients.

Practitioners undertaking this procedure must be Registered Practitioners

1.3 EQUIPMENT

External Ventricular Drain,
Designated drip stand at the bed side or pendant arm pole (if applicable)

ACTION	RATIONALE
1. Check that all connections and tubing are secure. Label the drain as EVD	To ensure that accidental removal is avoided and CSF does not leak out of the drainage system. Closed system minimises the risk of infection and accidental injection of intravenous medications
2. Maintain patient's head elevation if requested by medical staff (usually at least 30° head up)	To promote venous drainage from the head
3. Establish correct zero reference using the external auditory meatus as a landmark if lying on back. If lying on side, use bridge of nose.  Utilise spirit level if appropriate	The point approximates the location of the catheter tip at the foramen of Munro. It has been recommended for accuracy that the zero point is measured with a

	spirit level rather than visually.
ACTION	**RATIONALE**
4. Slide the chamber up the gauge until the arrow at the top of the chamber is at the height prescribed by the medical staff, e.g. 11cm as the picture below shows (Medical staff should request that the height be adjusted to drain a set amount each hour) 	This means that the EVD is at 11cm above the foramen of Monro, and for CSF to drain, the CSF pressure within the ventricles must be at least 11cm H20. 
5. Empty the CSF and record hourly the amount of CSF that has been drained on the EVD chart.	The amount of CSF drainage can be an indication of the ICP. An increase could indicate rising ICP.
6. Inform medical staff/nurse in charge if the amount of drainage exceeds 10mls more than previous volumes or if 30mls or more has drained in 1 hour	Average drainage for an adult with impaired CSF circulation or absorption is 10-15mls/hr. Excessive drainage may collapse the ventricles, pulling the brain from the Dura. When this happens, blood vessels in the Dura may rupture and cause a subdural haematoma.

7. If there is minimal or no drainage the tubing should be checked for kinks, blockage or closed stopcocks. If there is no obvious cause for lack of drainage, check to see if the level of the CSF in the tubing is oscillating.	No drainage may indicate that the tubing has become kinked or blocked by blood or protein particles.
ACTION	**RATIONALE**
8. Suspected blockage of the drain or a drop in the patients GCS must be reported to the neurosurgeon immediately. • **Do not attempt to unblock the drain.**	Reduced drainage may cause the redevelopment of raised ICP. If there is no drainage, but the drain is patent, the meniscus of the CSF should be seen to oscillate because of the normal pulsatile pressure. 'Osc' should be recorded on the CSF output chart to indicate that although the drainage is 0, the drain is still oscillating. However, if the CSF is seen not to swing, or oscillate, this could mean that the drain is blocked or a deterioration in the GCS. **The nurse must report this to the nurse in charge and a doctor immediately**.
9. Observe CSF for clarity and colour. • Normal CSF is clear, colourless and odourless. • Document and report any change to the nurse in charge/medical staff.	If the CSF is bloodstained, this would indicate that there is, or has been, blood within the ventricular system. If frank blood suddenly becomes present, the patient may have had an intraventricular bleed. **Nurse in charge and medical staff should be informed immediately.** Cloudy CSF could indicate an infection. Over drainage can also cause bleeding from the ventricle walls

10. The EVD should always be turned off before repositioning and mobilising the patient, or performing respiratory care.	These procedures could cause an over drainage of CSF as there can be a temporary increase in ICP during the movements. If this is allowed to happen, the ventricles could collapse. In addition, a low pressure headache could result as well as subdural collection.
11. Following the procedure, re-establish the zero point and turn the drain back on	To ensure that the CSF can drain freely and reduce the patient's ICP. If the drain is left turned off there will be a build up in the production of CSF causing an increase in ICP which could potentially lead to death.
12. Empty the EVD chamber and record drainage before transferring the patient on to another bed or to another department. Turn off the three-way taps. The entire drainage system may now be placed on the bed	There is a risk of drain disconnection and dislodgement when transferring the patient. The air inlet must be clamped because if the filter gets wet the CSF may not drain. If this does happen, the system must be replaced immediately
ACTION	**RATIONALE**
13.Record the neurological assessment of the patient as condition dictates • NOTE: Frequency of the assessment should be increased if the height of the drain is changed, if the drain is clamped for a prolonged period or if the drain becomes blocked or accidentally removed.	To detect any deterioration in the patient's condition, which may be the result of raised ICP due to hydrocephalus
14. To minimise infection, asepsis should be maintained at all times.	The catheter has direct passage into the ventricles of the brain, there is an increased risk of infection.

15. Administer antibiotics as prescribed ***(Neurosurgeons will make this decision).***	If prophylactic antibiotics are prescribed, these should commence on the day of insertion as per the Neurosurgeon's instructions.
16. The entry site should always be dressed with an aseptic occlusive dressing. • Always clean the entry site with chlorhexidine-alcohol wipes (Chloraprep).	This should be changed if it becomes loose or soiled. Wet dressing could indicate that the drain is leaking CSF at the entry site.
17. CSF sample may be requested by the Neurosurgeon. Frequency of sampling will be at the discretion of the named Consultant. Sampling is undertaken for culture and sensitivity and glucose. This information must be clearly charted. • Aseptic Technique must be utilised at all times to reduce the risk of infection • Assemble a clean dressing trolley with a dressing pack, sterile gloves, 10 ml syringe, green needle and two white topped universal containers. • Clean sampling port with chloraprep wipe for 30 seconds and allow drying for at least 30 seconds. • CSF samples should be taken from the port site. • The chamber should be emptied before the sample is taken then allowed to refill to 3-5 (the time to refill may vary). • This sample should then be retrieved for analysis. • With sterile gloves on, using the needle and syringe, gently withdraw 2-3 ml of CSF for each specimen (0.5 ml is the minimum required). • Remove and safely discard needle before introducing the CSF into the sample bottles.	Alterations in these findings, or the presence of organisms could indicate that an infection is occurring whether that is meningitis or ventriculitis. Sampling should be performed under strict aseptic conditions by a competent registered practitioner. *(Adopted from the EVD guideline from the Royal Hospital for Sick Children PICU-Neurosurgery, GGC)*

• Send to lab immediately for culture, sensitivity, cell count and glucose if indicated. **Depending on EVD set the sampling may be carried out by medical staff**	
ACTION	**RATIONALE**
18. Change the collection bag adopting the Aseptic technique approach, when it is three-quarters full and replace with a new bag	To enable drainage of the chamber
20. Regular analgesia should be available to the patient in addition to other basic nursing measures e.g. soft pillows, a calm quiet environment, regular change in positions, involvement in care planning and continuous reassurance.	To serve to reduce pain and discomfort.
21. EVD may be clamped on instructions of the Neurosurgeon following assessment of the patient's clinical condition and neurological status. • Any changes must be reported immediately to medical staff.	Clamping the drain may result in inadequate CSF drainage resulting in a rise in ICP and reduced conscious level.
21. The EVD is removed by medical staff when no longer required.	There is a risk of neurosurgical complication during removal.
The guidelines have been proposed after consultation with clinical textbooks, literature review, benchmarking and input from Neurosurgeon colleagues.	

1.4 References

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