

PAEDIATRIC NURSING PRACTICE MANUAL  
SECTION 12

CARE OF THE CHILD WITH NEUROLOGICAL OR NEUROSURGICAL CONDITION

12.2 EXTERNAL DRAINAGE OF CSF

12.2.1 CARE OF THE PATIENT HAVING EXTERNAL DRAINAGE OF  
CEREBROSPINAL FLUID

**Aims**

1. To allow cerebrospinal fluid (CSF) to drain externally.
2. To initiate drainage of CSF when the intracranial pressure (ICP) reaches a predetermined pressure (ie. the requested mmHg/cmH<sub>2</sub>O).
3. To monitor changes in the ICP through measurement of CSF drainage.

**Key points**

1. All nursing staff must work within their Scope of Nursing practice. It is their responsibility to know the limits of their practice relating to external ventricular drains (EVD) and to seek advice from senior nursing and/or medical staff to ensure the best outcome for the child.
2. Any deterioration or significant changes must be reported immediately to the child's neurosurgical team.
3. Consider the need for a medical review, MET call, or CODE Blue as indicated by the child's clinical condition. [PNPM 4.1](#) Code Blue (55) and Emergency Resuscitation.
4. Inspect extension set ports for the presence of vented cap(s) prior to connection to the child. Replace vented caps on unused ports with nonvented caps. Refer to [PNPM 2.3.2](#) Peripheral Intravenous (PIV) Access – Principles and Management.
5. In the Paediatric Intensive Care Unit (PICU), a patient with an EVD will have Intracranial Pressure (ICP) monitoring commenced at the time of admission. The Intensive Care Consultant, in consultation with the neurosurgeon, will decide when pressure monitoring will cease.
6. The drain may be attached to the same 3-way tap as the pressure monitoring line.
7. When the drain is open the zero mark must be at the level of the patient's external auditory meatus/tragus.
8. The pressure level at which the CSF is to be drained is determined by the neurosurgeon. This will be documented in the notes as either **cm H<sub>2</sub>O** or **mmHg**. Ensure the chamber is set against the correct scale.

## Identifying the Zero Point and Establishing Drainage of CSF

### Equipment

Codman external drainage set

IV pole

Laser light

PROCEDURE	ADDITIONAL INFORMATION
Identify the zero point (anatomical reference).	This is the location of the Foramen of Monro (FOM). It is estimated at the level of the external auditory meatus in the supine patient. <sup>1-3</sup>
Secure the EVD system to an IV pole. <sup>4</sup>	The drainage system is ideally positioned at the head of the bed. Do not place an EVD over cot sides.
Use the laser light to find a true horizontal line between the FOM and the zero line of the pressure scale on the EVD set. <sup>5</sup>	Ensure laser light is horizontal. The "Pressure Level" arrow level should correspond with the requested cmH <sub>2</sub> O (mmHg). <sup>5</sup>
Once the patient is comfortable, open the taps/clamps.	Ensure the tap/clamp below the chamber is closed.

### Management of the EVD

PROCEDURE	ADDITIONAL INFORMATION
<p><b>Patient Movement</b></p> <p>Clamp the drainage line between the child and the drainage chamber (by turning the three way tap) during <b>all</b> position changes, ambulation and/or with excessive crying.<sup>3,5</sup></p>	Avoids excessive drainage of CSF.
Unless ordered by the neurosurgeon do not clamp the EVD for longer than 30 minutes. <sup>1</sup>	
Re-establish the requested pressure level (of the graduated chamber) and zero point after <b>all</b> patient position changes. <sup>2,4,5</sup>	When open to drainage maintain the EVD system in an upright position at all times <sup>6,7</sup>
After unclamping the line observe for CSF flow. <sup>4,5</sup>	
<p><b>Dressing</b></p> <p>Cover the catheter insertion site with an occlusive dressing (eg. Fixomull).</p>	

PROCEDURE	ADDITIONAL INFORMATION
Secure the catheter so as to avoid tension at the insertion site and possible dislodgment.	
Leave the dressing intact until the neurosurgeon determines otherwise.	
Observe the dressing at least once per shift. Report if loose, soiled or evidence of leakage. Change with a sterile technique.	
<b>Observations</b> Record hourly full neurological observations as per <a href="#">PNPM 3.1.7</a> and four hourly temperature, for 24 hours post insertion. OR As determined by the child's neurosurgeon. Report pyrexia or any deterioration immediately.	
Observe drainage rate and tube patency hourly <sup>1,2,4,5</sup> and document. Note the colour of the CSF. <sup>1,5</sup> Report significant changes to the neurosurgeon.	CSF is normally clear and colourless; the sudden presence of blood may indicate haemorrhage and must be reported immediately. <sup>1</sup>
Ensure the CSF drips into the chamber If there is no flow or if there has been no drainage in any hour, check there are no kinks in line and that clamps are open.	The drainage chamber may be dropped below the FOM for a <u>brief</u> period only to check whether CSF drains onto the chamber. Once observed, the flow chamber must be re-aligned to prevent over drainage. <sup>1,5</sup>
<b>If the EVD appears blocked report to neurosurgeon immediately.<sup>1</sup></b>	

### To empty the graduated chamber

PROCEDURE	ADDITIONAL INFORMATION
Using the 3-way tap, close the line between the patient and the chamber, open the stopcock between the chamber and the drainage bag and allow the chamber to empty.	
Close the line between the chamber and the drainage bag and then re-open the line between the patient and the chamber.	



## Possible Complications <sup>1</sup>

**Inadequate drainage** may occur;

1. If the EVD system is placed too high above the level of the Foramen of Monro (FOM)
2. If CSF drainage is obstructed. This may occur when tubing is kinked or inadvertently clamped, the 3-way tap is turned the wrong way, the drainage bag is full, blood clots from previous or current haemorrhage and/or thick CSF blocks the system

Symptoms of raised intracranial pressure include changes in conscious level, bulging of fontanelle in infants, vomiting, irritability, lethargy and/or headaches.<sup>5</sup>

**Excessive drainage** may occur

1. If the EVD system is placed too far below the level of the FOM.
2. If there is excessive crying, particularly infants.

Symptoms include; sweating, tachycardia, headache, nausea, slurred speech.<sup>5</sup>

**Accidental disconnection:**

1. Disconnection of EVD system from ventricular catheter: Immediately clamp the catheter with atraumatic forceps and sterile gauze. Nurse the child in a supine position until a new EVD set is connected to the catheter. Consider keeping forceps and gauze beside the patient in case of accidental disconnection.
2. Contact the neurosurgeon immediately who will confirm whether the catheter needs to be changed.
3. If ventricular catheter is dislodged completely, cover site with sterile gauze and pressure dressing. Inform neurosurgeon immediately.

**Fluid and Electrolyte Imbalance:**

1. Patients with an EVD are losing CSF, which the body would normally reabsorb. The neurosurgeon may instruct CSF losses to be replaced mL for mL with 0.9% Saline.<sup>2</sup>

## Collection of CSF from an External Ventricular Drain

### Key Points

1. This is an aseptic non touch technique.<sup>2,4,5</sup> Refer to [A&NTT Framework](#).
2. PICU children will have specimens taken daily.
3. Ward patients will have specimens taken 3<sup>rd</sup> daily or as per the instruction of the neurosurgeon / clinical indication (usually daily if infection present).
4. Upon removal of the drain, the catheter tip will be sent to Microbiology.

### Equipment

70% Alcohol (for decontaminating trolley)  
 Dressing trolley  
 Dressing pack  
 Sterile gloves  
 5mL luer lock syringe  
 2 x 2% chlorhexidine<sup>2</sup> and 70% alcohol wipes  
 CSF specimen pot (sterile)

### Additional Equipment which may be required

Needle free bung

PROCEDURE	ADDITIONAL INFORMATION
Perform hand hygiene. Decontaminate trolley with alcohol 70% prior to procedure set up. Open sterile equipment onto sterile field.	
Positively identify the patient.	Refer to Pathology Manual, General Guidelines Section 2.
Turn off taps and clamps.	
Perform hand hygiene and don gloves.	
Disinfect the needle free bung and tap with 2% chlorhexidine and 70% alcohol wipes. Allow to dry.	Prior to first sampling ensure a needle free bung is attached to the sampling port. Use one wipe in each hand.
<b>PICU</b> - Attach syringe to sampling port closest to patient. <b>Ward</b> - Attach syringe to the sampling port located at the base of the graduated chamber.	

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