

External Ventricular Drain (EVD) Monitoring

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CONDITION/SKILL OVERVIEW

This quick guide was developed to provide a reference for bedside care and should be used in conjunction with the Intracranial Monitoring Evidence-based Clinical Review. An EVD is used to divert cerebral spinal fluid (CSF) primarily in patients with traumatic brain injury (TBI), hydrocephalus, subarachnoid hemorrhage (SAH), meningitis, and shunt malfunction but are not limited to this list. The advantages of an EVD include intracranial pressure monitoring and therapeutic drainage of CSF. The major disadvantage is the increased risk of infection, which increases with longer duration of use.

If you have not managed a patient with an EVD, it is important to seek guidance from experienced staff to demonstrate practices and elucidate other evidence-based resources. This guide does not replace your institutional guidelines for placement and management.

GENERAL SAFETY CONCERNS

- High risk of infection- use sterile or aseptic technique per institutional protocol.
- Do not use a continuous flush system.
- Maintain level of transducer and positioning of drainage device as ordered.
- Check orders to guard against over drainage (greater than 20 ml/hr) or underdrainage of CSF. Always bear in mind whether drain should be open or closed to drainage bag.
- Close stopcock before any change in patient position. Re-level before opening again to prevent CSF over drainage.

GENERAL SAFETY CONCERNS (CONT.)

- Guard against dislodgement. Maintain line free from extraneous equipment (e.g., Bedding, other IV tubing, etc.).
- RN do not push any medication through EVD lines. Guard against inadvertent or accidental medication administrations that are intended for intravenous lines.

INSERTION AND PLACEMENT OF THE EVD

****This is a sterile procedure that may occur in the ED, OR, or ICU.*** Check with your institution to determine if there is an “Insertion Bundle.” Shared responsibilities for provider and bedside nurse for placement include: patient prep, gathering supplies, monitor set up, *completion of pre-procedure check list*, verification of an informed consent, coagulation labs, and preprocedural medications. Check with the provider or team if you are not familiar with your role.

Supplies

- Cranial access kit
- Ventricular catheter (types may include antimicrobial or anti-clotting agent impregnation)
- Ventricular drain kit
- Transducer system
- Pressure cable and module
- Electric or disposable clippers
- Sterile prep kit / antimicrobial scrub sterile gloves, gown, mask, cap, drapes
- Sterile, preservative-free normal saline (NS) (0.9%), approximately 30-40ccs

Patient Preparation and Insertion

Institutions may have either “flushless” or use a universal transducer setup with flush capabilities. **An EVD does not have a continuous flush or pressure tubing.**

1. Check coagulation labs as indicated. INR: between 1.2-1.6.
2. Connect the transducer to drain set-up.
3. Remove the flush bag tubing from the set (if present) and replace with the Normal Saline (NS) syringe.
4. Attach the NS syringe to the drain tubing and prime the entire system with sterile preservative-free NS from syringe using sterile technique. Allow several extra drops of NS to exit the end of the tubing. Cap with dead end caps to minimize risk of air introduction or contamination.
5. Inspect for leaks prior to connecting the system to invasive drainage device.
6. Assist with sterile connection of the ventricular drain to the ventricular catheter once it is inserted and secured in place.
7. Attach monitor cable to transducer.
8. Zero monitor to level ordered (e.g., at tragus or external auditory meatus), observe ICP and waveform.
9. Obtain orders for HOB, reference point for leveling transducer, height of EVD, open or closed to drainage bag, alarm parameters (if monitored).

EVD SITE CARE

The literature does not recommend specific dressings or routine dressing changes. Check institutional policies. If dressing changes are necessary, sterile, or aseptic technique should be employed for dressing changes. Change dressing only as needed, when no longer occlusive or if soiled. Target infection rate is 0, not to exceed 1-2%.

Supplies

- Sterile dressing change kit & occlusive dressing
- Sterile gown, gloves, cap, mask, and drape

Procedure

1. Set up sterile/aseptic dressing change kit.
2. Don clean gloves. Remove non-occlusive/soiled dressing.
3. Don sterile PPE.
4. Change dressing according to institution protocol.

5. Document assessment of site, time and date dressing change.

Drainage Bag

Follow your institution’s policy regarding drainage practices when CSF drainage bag is full. It is suggested to change the bag only when it is full. Changing the bag occurs under sterile or aseptic technique to reduce the infection risk.

NURSING CARE

Cerebral Spinal Fluid (CSF) Sampling

The literature does not support routine sampling. Refer to your institution’s practices. In some facilities the RN is not permitted to draw CSF. Sterile technique, including use of non-neuro-toxic, manufacturer recommended antiseptics or other, should be employed to minimize infection risk. Refer to your institution's practices. CSF may be sampled via sterile/aseptic exchange of the drainage bag according to institutional policy.

Patient Assessment

A neurological assessment should be performed following insertion and at the intervals ordered (usually every 1-2 hours in ICU). Document CSF color, quantity, and clarity. Any change in neurological status, level of consciousness (LOC), increased headache, nuchal rigidity, or fever must be reported to the provider.

Zeroing

Frequency- Each shift change, return from travel or position change, or to trouble shoot waveforms or patient findings. Check your institution for specific protocol. EVD system should be zeroed to the monitor according to the manufacturers’ instructions.

Leveling the EVD

Refer to the device instructions or provider order for this anatomic reference point. **Re-level after patient positioning change, traveling, and to troubleshoot ICP readings.**

- Align transducer with the tragus, external auditory meatus (EAM) or other anatomical reference point, as ordered.
- The EVD chamber has incremental height markings. Align the drainage system at the ordered height in mmHg or cm H₂O.

ICP Measurement

Record the ICP per orders or institutional policies.

If open to drainage

1. Level the transducer to the patient's anatomical position as ordered.
2. If the stopcock is open for drainage, close the stopcock off to the drainage chamber to obtain adequate waveform and ICP reading. Following drain clamping, it may take time for the ICP reading to equilibrate.
3. Record ICP.
4. Open the stopcock.

If closed to drainage

1. Level transducer to the patient anatomical position as ordered. Check stopcock position to ensure it is closed for waveform measurement.
2. Observe and document waveform.
3. Record ICP.

Troubleshooting the EVD

- **Waveform dampened-** Relevel, zero, check stopcock.
- **No drainage-** Drain may be obstructed by brain tissue, blood clots or external obstruction to system (i.e., tubing kinks, disconnection, other occlusion). To assess patency temporarily lower the system drop bag and observe for CSF tidaling or flow. Follow your institution's protocol. No drainage can also be attributed to improper leveling. Assess patient positioning in relation to level.
- Contact provider for management of obstruction.
- **Over Drainage-** May occur when the drain is not properly leveled. Symptoms include headache, nausea, vomiting, sweating, among other neurological changes.
- Increased amplitude waveforms have numerous etiologies that can be reflective of in vivo conditions. Refer to the *AANN Core Curriculum* for additional trouble shooting.

***When troubleshooting the drainage system, it is also important to concurrently perform neuro checks.*

Patient Positioning

- The system should be re-leveled whenever position is changed.
- Drain must be closed prior to mobilization.
- It is acceptable to transfer patient out of bed and mobilize with an EVD depending on risk/benefit and provider order.
 - Drain closed:
 - Relevel after position change.
 - Drain opened:
 - Close the drain while moving the patient.
 - When in desired position, level and turn stopcock to reopen. This guards against over drainage during movement.

Patient Travel

Discussion with the team about risk vs benefit and orders for drain open or closed during travel and testing is warranted. Nurse should accompany patient when off the unit using travel monitor to monitor ICP and ensure stopcock is in ordered position.

EVD Removal

1. Not to be removed by RN. Removal solely by medical provider.
2. Set up removal kit.
3. Place patient in semi-fowlers position.
4. Disconnect from monitor.
5. Assist provider with removal and site dressing.
6. Monitor for signs of drainage or infection.

PATIENT/FAMILY EDUCATION

Provide families with education about EVD monitoring, importance of positioning and safety concerns. Place signage in the room as reminders to patients, family, and other staff.