	Policies and Procedures RNSP: Advanced RN Intervention Title: CEREBROSPINAL (CSF) DRAINAGE – EXTERNAL VENTRICULAR DRAIN (EVD)– ASSISTING WITH INSERTION, CARE OF, ASSISTING WITH REMOVAL ID Number: 1107
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DEFINITIONS

External Ventricular Drain (EVD)-This is a device that diverts cerebrospinal fluid (CSF) from the ventricles of the brain into a closed drainage system. It is necessary when there is a buildup of fluid within the ventricular system in the brain that causes a rise in intracranial pressure and subsequent deterioration in the patient’s level of consciousness.

Intraventricular- Within a cerebral ventricle. The **ventricles** of the brain are a communicating network of cavities filled with cerebrospinal fluid (CSF) and located within the brain parenchyma.

Ventriculostomy- The insertion of a catheter into a lateral ventricle through a burr hole made in the skull for cerebrospinal fluid (CSF) drainage. The external ventricular drain is attached to this catheter

Neurosurgeon refers to the Neurosurgeon or neurosurgical residents or intensivist.

ROLE:

Graduate Nurses (GNs) – GNs identified by the manager in target practice settings, will be certified in this RN Speciality Practice (Advanced RN Intervention): External Cerebrospinal (CSF) Drainage – External Ventricular Drain(EVD) - Assisting with insertion, Care of, Assisting with Removal with direct supervision by certified RNs for patients requiring an external lumbar drain for CSF drainage.

Registered Nurses: (RNs) – RNs identified by the manager in target practice settings, will be certified in this RN Speciality Practice (Advanced RN Intervention): External Cerebrospinal (CSF) Drainage – External Ventricular Drain(EVD) - Assisting with insertion, Care of, Assisting with Removal.

1. PURPOSE

- 1.1 To describe the set-up and maintenance of the External CSF Drainage system used as an EVD
- 1.2 To maintain consistent standards for monitoring CSF drainage and the patients neurological status.
- 1.3 To minimize the risk of infection, damage, displacement and other complications associated with the care and use of External Ventricular Drainage system.

2. POLICY

- 2.1 The RN/GN certified in this RNSP will have first completed the following learning modules/activities prior to assisting with insertion, care of, and assisting with removal of External Cerebrospinal (CSF) Drains - External Ventricular Drains (EVD) independently
 - Attended an educational session on EVDs,
 - Completed the learning package and quiz and returned it to the CNE
 - Complete skills checklist with a certified RN during first insertion, to validate and ensure safety checks are followed appropriately.
- 2.2 Neurosurgeon Order Required
 - For the position of the EVD drain by ordering a pressure level (cmH₂O) in relation to the zero reference point or external auditory meatus. (PICU: pressure level is always in mmHg)
 - For any pressure level adjustments. In addition an hourly volume to be drained may be ordered
 - For the frequency of monitoring the patient's neurological status and vital signs
 - For sampling CSF
 - For clamping of EVD drain, either for transporting patient or trial of clamping prior to removal
- 2.3 Special Considerations
 - Insertion and removal are performed using strict aseptic technique. When caring for the external drainage system, maintain a sterile, closed system to prevent infection
 - Preference is to insert the EVD in the operating room. Resuscitation equipment must be accessible. Ideally the patient should be NPO but this will depend on the urgency of the procedure and the Neurosurgeon orders
 - Chlorhexidine is the antiseptic of choice.
 - For inadvertent EVD tubing disconnections a padded forcep and sterile dead ender cap is required to be with the patient at all times
- 2.4 Neurosurgeon Responsibilities
 - Will obtain consent for the procedure
 - Will apply initial dressing. Subsequent dressing changes can be performed by the RN
 - Will flush an obstructed external ventricular catheter and drainage system as needed
 - Will access the patient stopcock for administering intraventricular medications
 - Will access the patient stopcock for CSF sampling
 - Will remove the external ventricular catheter and drainage system
- 2.5 Certified RN Responsibilities
 - Will monitor the patient position, head of bed and bed height to maintain the ordered zero reference point and pressure level

- Must clamp drain when changing patient position or during transport (patient specific orders may be written)
- Will monitor EVD drainage system q1h and patient temperature q4h unless otherwise ordered.
- Will monitor the patient's neurological status as ordered by the Neurosurgeon or Intensivist
- Will access the drip chamber stopcock only for CSF sampling
- Must accompany the patient when transported off the ward

3. PROCEDURE

3.1 Assisting with Insertion (Insertion procedure should be done in the OR or Critical Care)

3.1.1 Supplies

- Ventricular catheter
- External drainage and monitoring system SKU #43300
- Laser level SKU #43301
- Cranial Access Kit SKU#210060
- Surgical stapler
- Disposable cautery pen
- Surgical Clipper and disposable head
- Sodium Chloride Injection, 10 ml
- Alcohol based hand rub (ABHR)
- Mask, or mask with shield (s)
- Sterile gown(s)
- Sterile gloves
- Sterile towels & drape (with centre hole)
- Antiseptic Solution (Chlorhexidine)
- 1% Lidocaine Hydrochloride with Epinephrine Injection
- Curved needle suture package (2.0 Prolene, 3.0 Vicryl)
- Sterile occlusive transparent dressing
- Tape
- Chlorhexidine 2% with 70% Alcohol swabs
- Syringes 6 ml and 12 ml
- 25 gauge needle
- Incontinent pad(s)
- Requisitions and sterile specimen containers for CSF sampling
- Padded Forcep
- Sterile dead ender
- Designated IV pole

3.1.2 Verify correct patient with 2 identifiers

3.1.3 Ensure informed consent is obtained and documented

3.1.4 Perform baseline neurological assessment and vital signs. Record data on appropriate record.

3.1.5 Assist Neurosurgeon with the following as required:

3.1.5.1 Neurosurgeon to assemble drainage system according to manufacturer's instructions (Certified RN does in ICU and PICU)

Note: Ensure Neurosurgeon has flushed system prior to connecting to patient

3.1.5.2 Perform Hand Hygiene

- 3.1.5.3 Clip hair using surgical clipper, prepare skin with antiseptic solution
- 3.1.5.4 Drape
- 3.1.5.5 Open sterile kit and supplies
- 3.1.5.6 Hand hygiene and don sterile gloves and PPE
- 3.1.5.7 Neurosurgeon Infiltrates site with local anesthetic, inserts ventricular catheter, secures catheter with sutures and/or staples and connects the catheter to the primed drainage system tubing
- 3.1.5.8 RN will ensure the tubing is secure
- 3.1.5.9 Neurosurgeon applies sterile occlusive transparent dressing using tape to secure the edges which will remain in place until the catheter is removed, or dressing becomes soiled or displaced.
- 3.1.5.10 Ensure the CSF drainage system is mounted on dedicated IV pole (Appendix A Figure 1)
- 3.1.5.11 Attach laser level (Appendix A Figure 2)
- 3.1.6 Level the EVD system in relation to the floor. (See Appendix A figure 3)
- 3.1.7 Level the EVD system in relation to the patient. (See Appendix A Figures 4 & 5) Loosen the screw and adjust the height of the drainage system centering the laser pointer to the patient's external auditory meatus. This represents the zero reference point.
- 3.1.8 Positioning the Drip/collection Chamber. (see Appendix A figure 6) Loosen the screw and slide the colored drip chamber pressure reference line to the ordered pressure setting in cm H₂O or mm HG. Tighten screw to secure.
- 3.1.9 Open system stopcock to allow CSF to drain from patient and observe for CSF dripping into the drip chamber or movement of fluid in the tubing. Assess status of slide clamps and stopcocks.
- 3.1.10 Send CSF specimens as ordered.

Note: *On occasion when a patients existing Ventroperitoneal or lumboperitoneal shunt is malfunctioning i.e. obstructed or infected, the neurosurgeon may externalize it. The distal end will be connected to the CSF drainage system which then acts as a collection chamber. The existing pressure gauge in the shunt will still be functioning so parameters for levelling may not be ordered.*

- 3.1.11 Documentation
 - 3.1.11.1 Nurse's Progress Notes/Flow Sheet
 - date and time of insertion
 - name of physician
 - how patient tolerated the procedure
 - color, consistency and amount of CSF drainage
 - baseline and post procedure neurological assessment and vital signs
 - height of head of bed and pressure level of drip chamber (cm H₂O)
 - condition of dressing
 - specimens sent
 - 3.1.11.2 Nursing Care Plan
 - date of insertion
 - ordered pressure level of drip chamber
 - ordered patient position and activity
 - specimens sent
 - frequency of neurological signs and vital signs
 - range of hourly CSF drainage ordered
 - frequency of dressing assessment

- when and/or if to clamp tubing
- 3.1.11.3 MAR
- Any medications administered, including 2% Lidocaine

3.2 Care of External Ventricular Drainage System (For additional information please see learning package)

3.2.1 Supplies to be kept at bedside

- Designated IV pole
- Laser level (SPD# 43301)
- Sterile dead enders to apply to drip chamber stopcock/sampling port or ventricular catheter
- Padded forcep
- Chlorhexidine 2% with 70% Alcohol swabs

3.2.2 Leveling the external ventricular drainage system

- 3.2.2.1 Ensure external ventricular drainage system is mounted on designated IV pole.
- 3.2.2.2 Attach laser level if not already attached (Appendix A Figure 3)
- 3.2.2.3 Level the EVD system in relation to the floor. (See Appendix A Figure 3)
- 3.2.2.4 Level the EVD system in relation to the patient. (See Appendix A Figures 4 & 5)
Loosen the screw and adjust the height of the drainage system centering the laser pointer to the patient's external auditory meatus. This represents the zero reference point.
- 3.2.2.5 Positioning the Drip/collection Chamber. (see Appendix A figure 6) Loosen the screw and slide the colored drip chamber pressure reference line to the ordered pressure setting in cm H₂O or mm HG. Tighten screw to secure. If the patient position changes i.e. slides down in bed, the system has to be leveled to the ordered zero reference point again. The drip chamber is not adjusted unless the Neurosurgeon changes the order for the pressure level line in relation to the zero reference point (external auditory meatus).
- 3.2.2.6 Utilize 'lock out' on the bed controls to avoid inadvertent bed position changes. Place signage "Do Not Adjust Bed" appropriately.

3.2.3 Monitor the following parameters:

- 3.2.3.1 The patient's **neurological status** utilizing the Glasgow Coma Scale q1h or as ordered. Notify Neurosurgeon of any change in neurological status.
 - Signs/symptoms of over drainage include:
 - Headache - worse when head of bed raised
 - Decreased level of consciousness
 - Nausea, vomiting
 - Visual disturbances
 - Limb weakness
 - Hyponatremia
 - Seizures
 - in infants-sunken fontanel, irritability, tachycardia
 - Low intracranial pressure (ICP) reading (ICP monitoring performed in Critical care unit only)
 - Signs/symptoms of under drainage include:
 - Decreased level of consciousness
 - Headache – worse when head of bed lowered
 - Nausea, vomiting
 - Change in motor response
 - Pupillary changes
 - Visual disturbances

- Irregular or decreased respiratory rate
- In infants-bulging fontanel, irritability and lethargy, hypertension, bradycardia, apnea, sun setting eyes, poor feeding
- Increased ICP reading (ICP monitoring performed in Critical care areas only)

3.2.3.2 Patient's **vital signs** q1h or as ordered. **Temperature** should be monitored q4h or as ordered. Record on appropriate clinical record. Report if elevated. (CSF may be ordered for C&S).

Note: *If actively cooling the patient a rectal temp is recorded Q1h*

3.2.3.3 The **external CSF drainage system** (EVD)q1h and as necessary for patency by observing for CSF dripping into the drip chamber or pulsating CSF in tubing, appropriate position of slide clamps and stopcocks, and for kinks or disconnects in tubing.

Note: *If the ventricular catheter inadvertently disconnects from the CSF drainage system tubing, clamp the catheter with a padded forcep and apply a sterile dead ender cap. Notify the Neurosurgeon and obtain a new CSF drainage system for the Neurosurgeon (or certified PICU or ICU RN) to reconnect.*

3.2.3.4 **CSF** volume, color and clarity q1h or as ordered. Record amount of CSF drainage on appropriate fluid balance record.

Note: *Reassess patient and notify Neurosurgeon immediately if drainage begins to accumulate very rapidly (i.e. greater than 20mls/hr for adults, 10-15mls/hr for pediatrics) or notify neurosurgeon if there is no drainage and no CSF pulsating in tubing as there could be possible catheter occlusion.*

3.2.3.5 The **cranial dressing** should remain occlusive and transparent with edges taped. If it becomes soiled or wet, notify the Neurosurgeon. Observe for signs of infection, redness, swelling, and discharge around the insertion site.

3.2.4 Emptying the Drip chamber into the Collection Bag

3.2.4.1 Record amount of CSF in the drip chamber on appropriate record

3.2.4.2 Position the system stopcock with 'off' to the patient line

3.2.4.3 Position the drip chamber stopcock with 'off' to the sampling port.

3.2.4.4 Drain CSF into the collection bag.

3.2.4.5 Position the drip chamber stopcock with 'off' to the drip chamber (See Appendix B figure 4).

3.2.4.6 Position the system stopcock with 'off' to the dead ender to open patient line

3.2.5 Clamping of the external CSF drainage system for Patient activity/mobility and Patient Transport

3.2.5.1 Obtain Neurosurgeon order to clamp drain indicating appropriate amount of time allowable for activity or transporting patient.

3.2.5.2 For patient activity/mobility -- Clamp by positioning system stopcock with 'off' 'to the patient line (see Appendix B). Reposition patient in bed or up to a chair, level to the zero reference point and rotate the stopcock with 'off' to the dead ender. This opens the line to the patient.

3.2.5.3 For patient transport--Record CSF volume in drip chamber then drain CSF into collection bag. (See 3.2.4 above). While clamped the drainage system can be left hanging on designated IV pole or added to another IV pole.

3.2.5.4 Certified RN accompanies patient to destination. At destination if the patient condition deteriorates the RN can unclamp the EVD drainage system. Ensure the EVD drain is leveled to the zero reference point and that the ordered pressure level line has not changed.

3.2.6 CSF Sampling

3.2.6.1 Physician order required. Generate computer requisitions.

Note: *If sampling for "Suspect Creutzfeldt-Jacob Disease (CJD)" please follow protocols listed in Infection Prevention and Control Policy #40-40*

3.2.6.2 Supplies

- Requisitions
- Sterile specimen containers
- Chlorhexidine 2% with 70% Alcohol swabs
- 6ml Syringe
- Sterile dead ender
- Alcohol based hand rub (ABHR)
- Face shield/mask or goggles
- Clean gloves

3.2.6.3 Perform hand hygiene and don PPE

3.2.6.4 Position system stopcock with 'off' to the patient line (see appendix B figure 3)

3.2.6.5 Remove dead ender

3.2.6.6 Vigorously scrub sampling port with chlorhexidine/alcohol swab. Allow to air dry for 1 minute.

3.2.6.7 Attach sterile syringe to sampling port

3.2.6.8 Position the drip chamber stopcock with 'off' to the collection bag' (see appendix B figure 4).

3.2.6.9 Aspirate 3-5 ml of CSF or available amount

3.2.6.10 Position the drip chamber stopcock with 'off' to drip chamber

3.2.6.11 Remove syringe and apply sterile dead ender

3.2.6.12 Confirm CSF drainage system is leveled and open system stopcock to patient

3.2.6.13 Maintaining sterile technique transfer the CSF from syringe into specimen tube(s). Label tube(s). (samples will be discarded by lab if incorrectly labeled or requisition(s) not signed)

Note: *CSF specimens cannot be sent to the hospital lab via the pneumatic tube system as it destroys cells. Have the unit support worker or lab porter transport.*

Note: *Only the neurosurgeon may sample CSF from the patient stopcock (closest to the insertion site) on the CSF drainage tubing*

3.2.7 Replacing the Collection Bag

3.2.7.1 Supplies

- Obtain collection bag from SPD SKU#43310
- Chlorhexidine 2% with 70% Alcohol swabs
- Sterile gloves
- Face shield/mask or goggles

3.2.7.2 Maintain sterile technique when replacing the collection bag. Face shield/mask and sterile gloves are worn.

- 3.2.7.3 Ensure the drip chamber stopcock is positioned with 'off' to the drip chamber. (see appendix B) (This stops the flow of CSF to the collection bag and allows the bag to be changed.)
 - 3.2.7.4 Using the clamp on the collection bag, occlude the tubing leading to the collection bag.
 - 3.2.7.5 Scrub the connection. Twist the connector on the bag counter clockwise to disengage.
 - 3.2.7.6 Connect the new bag to the tubing and hang collection bag on built in hooks.
 - 3.2.7.7 Open clamp on the collection bag.
 - 3.2.7.8 Dispose of the used collection bag in biohazardous waste as per hospital policy.
- 3.2.8 Injecting Medication into the CSF drainage System
- 3.2.8.1 Only a neurosurgeon may inject medication into the CSF drainage system tubing.
 - 3.2.8.2 Administration of medication to the patient can be accomplished via the injection site on the Y-connector next to the Patient Line stopcock.
 - 3.2.8.3 Leave line clamped post medication infusion for 1 hour or as per Neurosurgeon order.
- 3.2.9 Irrigating the Ventriculostomy Catheter
- 3.2.9.1 If there is no drainage of CSF or fluctuation with respirations in the tubing the catheter may be occluded. Debris such as tissue or blood clots can obstruct the catheter and cause large increases in ICP which places the patient at greater risk for secondary brain injury.
 - 3.2.9.2 Notify neurosurgeon. Only a neurosurgeon may irrigate the ventriculostomy catheter.
- 3.2.10 Documentation for care of:
- 3.2.10.1 Nurse's Progress Notes/Flow Sheet
 - Neurological assessments on Clinical record
 - Vital signs and temperature on Clinical record
 - Patency of drainage system
 - Color, volume and clarity of CSF
 - CSF specimens sent to lab
 - Appearance of dressing, insertion site
 - Dressing Changes
 - Replacement of collection bag
 - Reason for notifying the Neurosurgeon
 - Response of patient to drain being clamped during transport
 - Inadvertent line disconnect
 - Irrigation of the ventricular catheter and /or drainage system (Neurosurgeon documents procedural note).
 - 3.2.10.2 Nursing Care Plan
 - Ordered pressure level of drip/collection chamber
 - Frequency of monitoring Neurological assessment, Vital signs
Temperature
 - Time parameters for clamping of the external CSF drainage system
 - CSF sampling
 - 3.2.10.3 Fluid Balance Record
 - Hourly CSF drainage volumes
 - 3.2.10.4 MAR
 - Neurosurgeon must sign for medications given intraventricularly

3.3 Assisting with Removal of the Intraventricular Catheter

- 3.3.1 Prior to removal of the CSF drainage system and ventricular catheter the Neurosurgeon may order a trial of drain clamping. During this process the RN increases monitoring of the patient observing for signs and symptoms of increased intracranial pressure.

Note: *If patient condition deteriorates during the trial notify the neurosurgeon. A CT scan may be ordered or the neurosurgeon may order the drain to be unclamped. The nurse should confirm orders for the levelling of the CSF drainage system.*

- 3.3.2 Obtain supplies for removal

- sterile gloves and clean gloves for assistant
- mask/face shield for all involved
- Alcohol based hand rub (ABHR)
- suture material (3.0 Novafil or 2.0 Silk)
- Suture removal kit or sterile suture scissors and sterile forcep
- Stapler remover
- Sterile dressing tray
- Sterile needle driver
- Sterile 10 ml syringe (if specimen required)
- Sterile specimen tube SKU #86626 (Black top)
- absorbent/incontinent pad
- normal saline
- Chlorhexidine 2% with 70% Alcohol swabs
- Transparent occlusive dressing
- sterile specimen cup and sterile scissors (if tip C&S required)

- 3.3.3 Position patient as requested

- 3.3.4 Neurosurgeon removes dressing, preps skin, removes suture(s)/staples and removes ventricular catheter

- 3.3.5 Neurosurgeon applies suture and occlusive transparent dressing to site.

- 3.3.6 Complete requisition and send tip for culture and sensitivity if ordered.

- 3.3.7 Monitor site for swelling, CSF leakage, signs and symptoms of infection and report to Neurosurgeon if any noted.

- 3.3.8 Monitor patient for change in neurological status related to an increase in intracranial pressure (ICP)

- 3.3.9 Documentation for removal

- 3.3.9.1 Nurses Progress Notes

- patient response to trial of clamping drain if done
- date and time of ventricular catheter and CSF drainage system removal
- condition of insertion site
- physician's name
- type of dressing applied
- how patient tolerated procedure

- 3.3.9.2 Nursing Care Plan

- trial(s) of EVD clamping
- date of removal

- if catheter tip sent for C&S
- type of dressing applied
- frequency of dressing/site assessment
- date of suture removal (if applicable)

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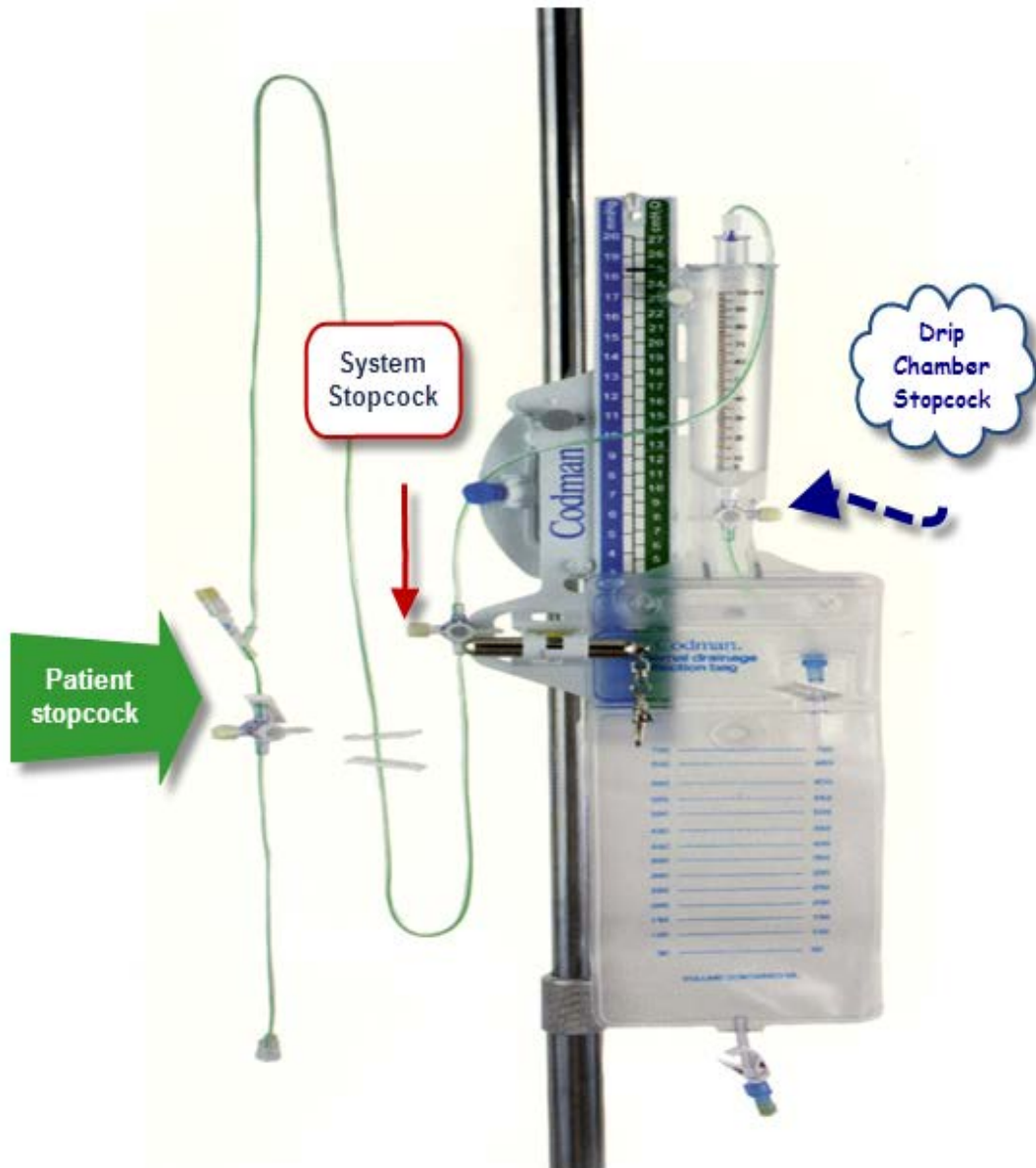
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Appendix A

Codman System

Priming the system is done **only by the neurosurgeon or resident prior to connecting to the patient. ICU and PICU nurses are certified to prime the system.



Patient stopcock (on tubing closest to patient) is accessed only by the Neurosurgeon with specific order i.e. for sampling, medication administration or drain removal



Figure 1

1) Secure the Codman system to the IV pole by fitting the clamp over the pole and tightening the blue screw. (See Figure 1)



Figure 2

2) Attach leveling device. Point the laser towards the patient. (See Figure 2)

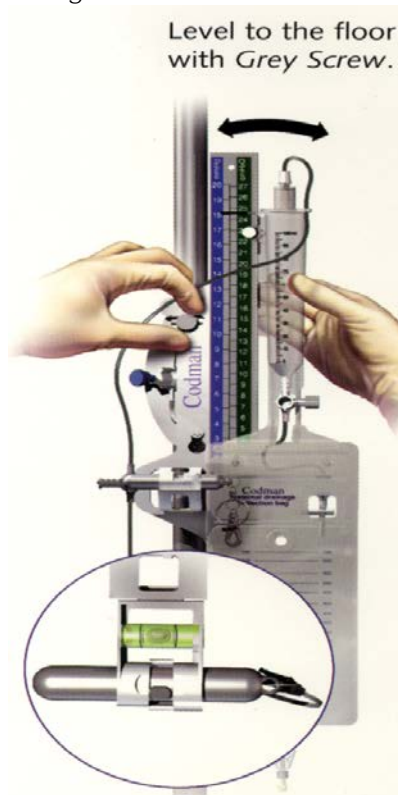


Figure 3

Level the unit to the floor by adjusting the grey screw, adjust the system sideways keeping the air bubble in the level centered between the 2 dark lines.
(See Figure 3)

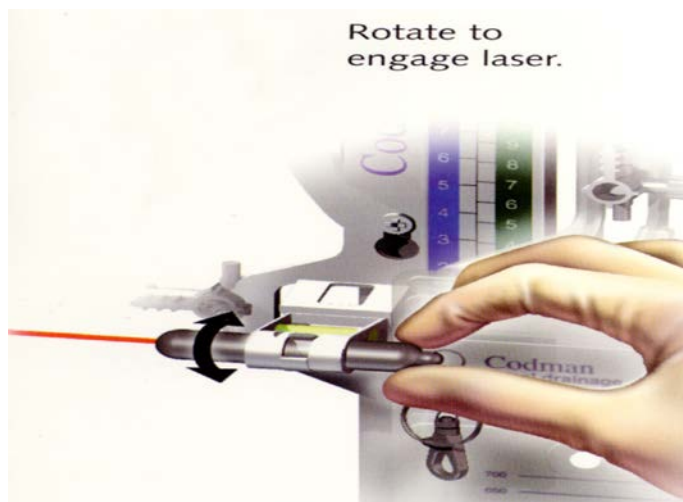


Figure 4 Rotate the laser pointer until the laser emits from the pointer.

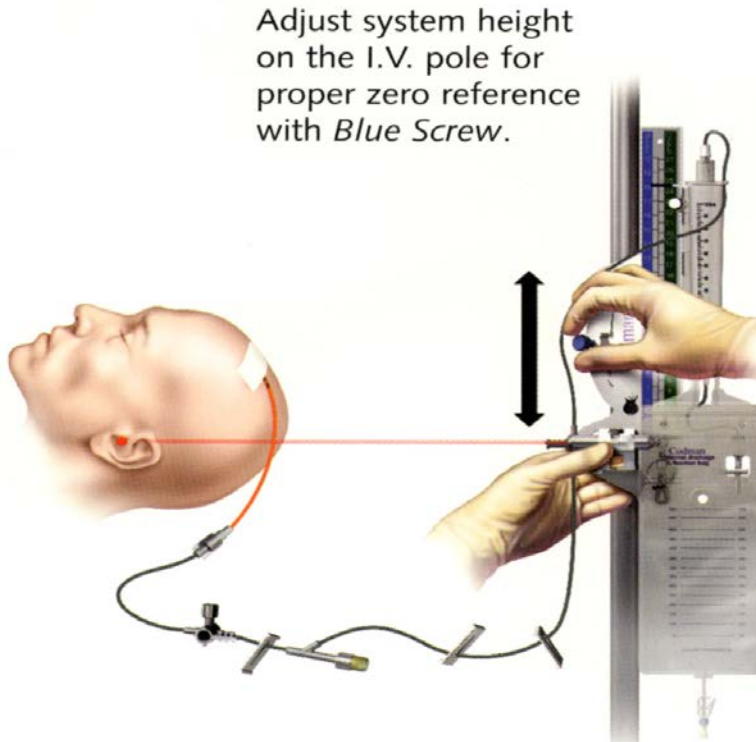


Figure 5

- 5) a. Loosen the blue screw and adjust the height of the unit centering the laser pointer to the patient's external auditory meatus (ventricular drainage) when lying supine. This represents the "zero" reference point. If the patient is side lying the zero reference point is usually
- b. Rotate the laser pointer until laser is extinguished

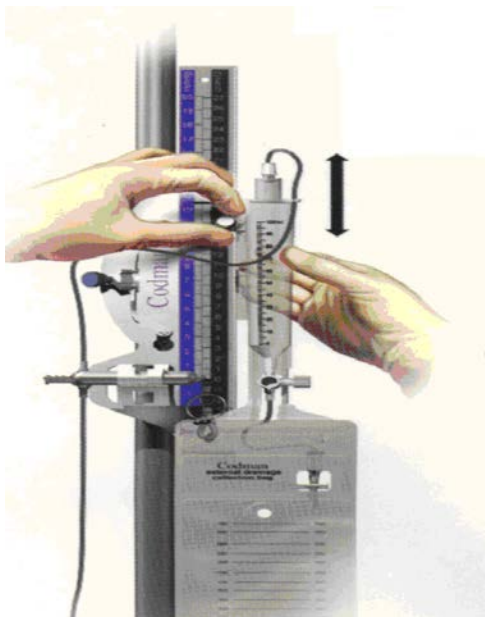
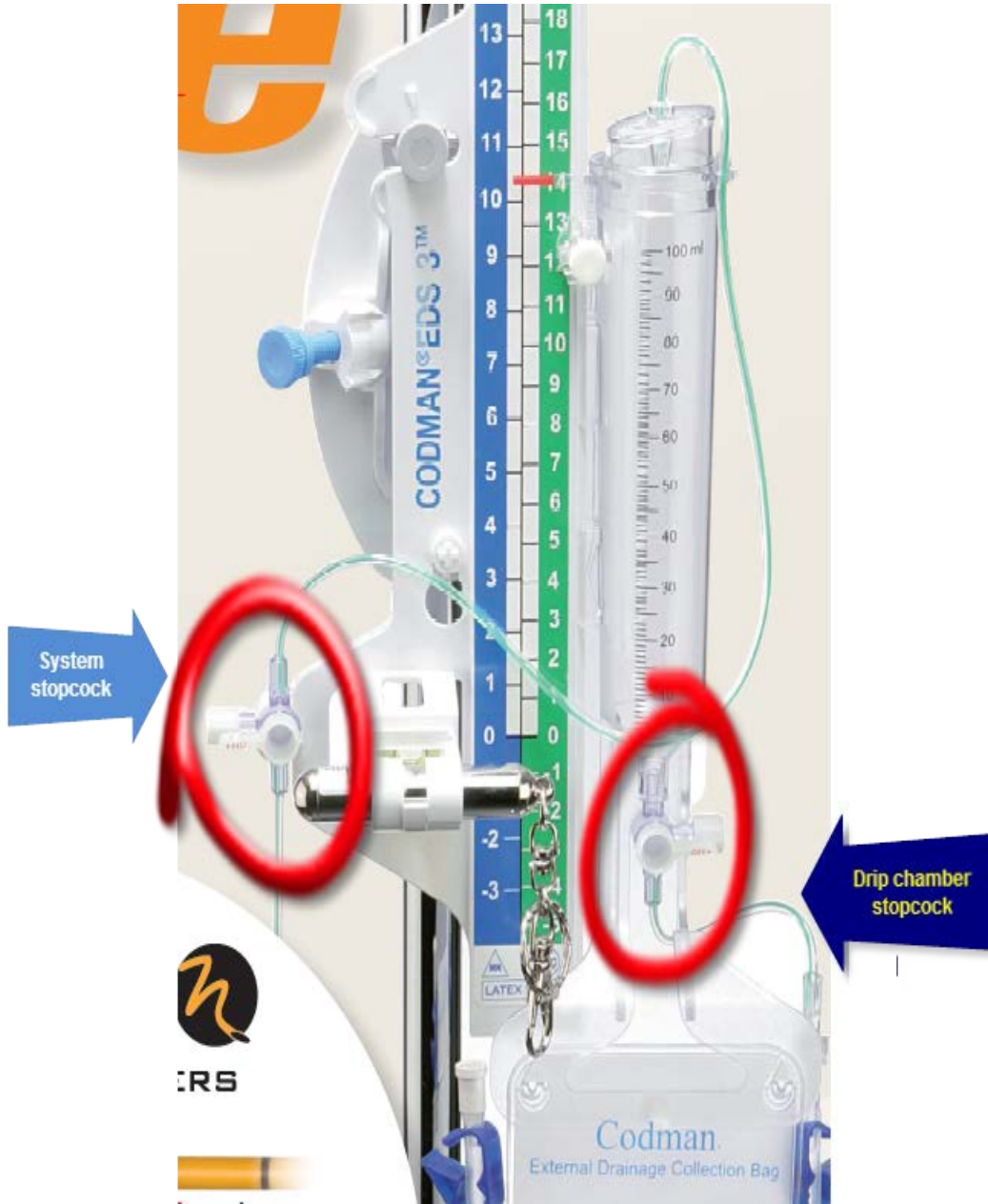


Figure 6

- Tighten all connections and make sure there are no kinks
- Position the drip chamber stopcock with 'off' to the drip chamber
- Position the system stopcock with 'off' to the dead end allowing the CSF to flow from the patient.

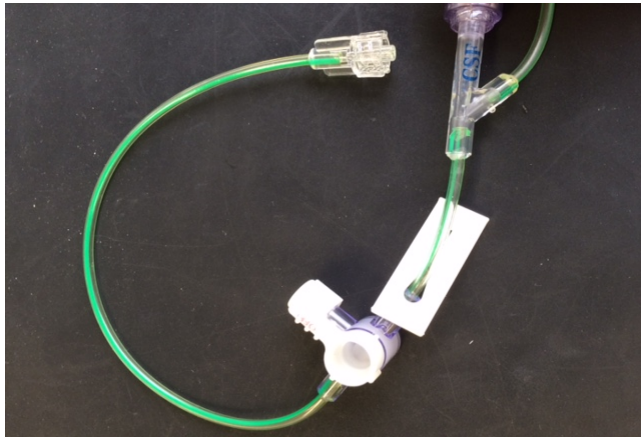
Appendix B

CSF External Drainage System



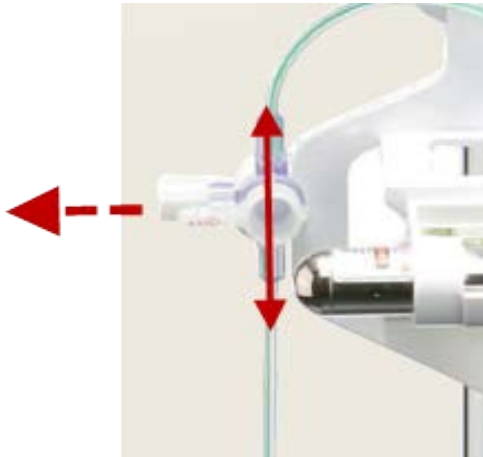
Patient stopcock (on tubing closest to patient) is accessed only by the Neurosurgeon with specific order i.e. for sampling, medication administration or drain removal.

Patient Stopcock



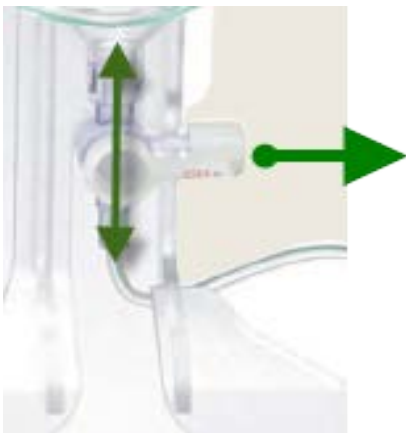
- Controls the flow of CSF from the patient line to the other components of the drainage system.
- only closed to patient** with specific physician order (following medication infusion or prior to removal)

System Stopcock



- Controls the flow of CSF to the drip chamber
- “OFF” stops the flow of CSF in the direction it is pointed
- this stopcock position** allows CSF to drain into the drip chamber

Drip Chamber Stopcock



- Controls whether the CSF flows into the collection bag or accumulates in the drip chamber
- sampling by RN is done here
- this stopcock position** allows CSF to drain into the collection bag