

**2016 American Nurses
Association Annual Conference**

Connecting **Quality, Safety**
and **Staffing** to Improve Outcomes



Establishment of an external ventricular drain (EVD) best practice guideline:

The quest for a comprehensive, universal standard for EVD care

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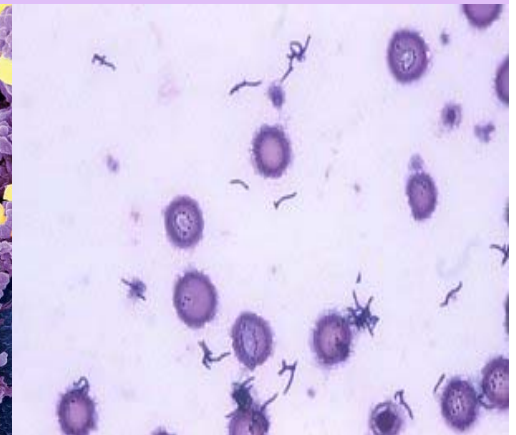
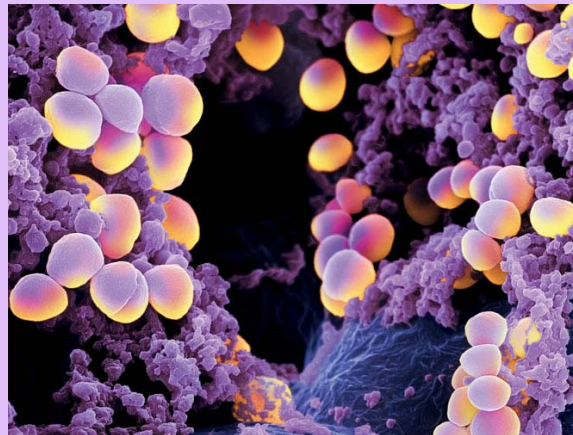


EVDs and Infections

Unfortunately, patients with EVDs are prone to getting infections, and these infections can dramatically impact the patient's hospital course, and ultimately the risk of death.

Reports indicate that Up to 45% may become infected.

- Organisms that are found most often are:
 - *Staphylococcus aureus*
 - *Propionibacterium acnes*
- CSF reports that are commonly associated with meningitis or ventriculitis are those with high protein, low glucose and high WBC.



EVD-Related Infections

- Ventriculitis, subdural empyemas and intracranial abscesses are associated with EVD placement, but did you know that
 - abdominal abscesses
 - skin infections
 - Endocarditis
 - Sepsis
 - Osteomyelitis

Can also be related to EVDs

EVD Infection Prevention

- 1) Standardized protocol for EVD insertion and maintenance
- 2) Compliance monitoring
- 3) Multidisciplinary effort
- 4) Education

Organizational Goal: Strive for a 0% infection rate.

• EVD Catheter Insertion:

- Pre-Insertion:
 - Hair removal
 - Skin prep
- Aseptic technique
- Catheter Selection
- Monitoring protocol adherence

- 1) Clip hair around EVD
- 2) Skin prep : Chlorhexidine
- 3) Maximal barrier precautions
- 4) Minimize # of personnel present during procedure
- 5) Use antibiotic coated catheter
- 6) Use EVD insertion checklist

- EVD Maintenance
- Cerebrospinal Fluid Sampling

- 1) Employ aseptic technique when handling EVD
- 2) Label EVD tubing
- 3) Sample CSF only from distal port
- 4) Obtain samples only when clinically indicated
- 5) Minimize EVD manipulation and length of time catheter is in place

Creation of a model that guides the focus of the EVD project

• EVD Dressing

- Type of dressing
- Frequency of dressing change
- Personnel approved to perform dressing change

- 1) Use bio-occlusive dressing with biopatch™
- 2) Change dressing weekly or if dislodged
- 3) Any clinician with deemed competency performs dressing changes

- 1) Provide ongoing education/competency assessment for NSICU staff re: EVD care
- 2) Perform infection control rounds
- 3) Monitor rates of infection

- Education
- Surveillance

Creation of a new EVD standard...

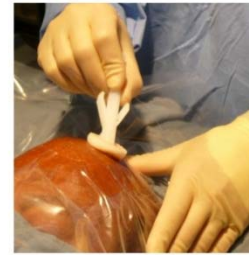
Purpose:

To provide consistency in the insertion, care and maintenance of intra-ventricular drainage devices across the NYULMC inpatient areas to reduce the potential risk of infection

Wide clipping and chlorhexidine prep #1



Full drape and chlorhexidine prep #2



Full barrier precautions



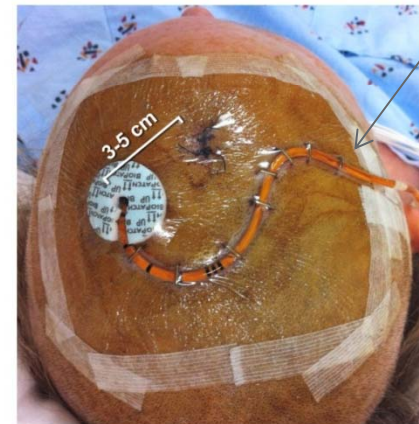
Transparent dressing film



Chlorhexidine patch



Adhesive strips



Use of standardized EVD checklist to ensure consistent practice

Snapshot of the *Changes* to EVD insertion, Care and Maintenance Practices

<u>Previous State</u>	<u>Current State</u>
Drape for procedural site only	Use of a full body drape during EVD placement
Cleanse skin with alcohol prior to EVD placement	Clean skin with chlorhexadine prior to EVD placement
No use of antibacterial protection around insertion site	Use of a chlorhexidine biopatch
No monitoring of insertion practices	Use of a checklist during EVD insertion
Use of gauze dressing to cover EVD site	Use of a large bioocclusive dressing with steri-strips along the borders
Shave head to remove hair	Use of clippers to remove hair
Flush transducer No priming of line	Using flush-less transducer Prime EVD
Daily CSF sampling	CSF sampling only once at initial EVD placement and then q48hours as needed for suspected infection. Do not shake vial. All CSF samples must be hand delivered to lab for immediate processing
Changing the collection bag when full...no standardized practice however	Changing the collection bag when 3/4 full
No standardized practice during repositioning, when patient coughs or vomits.	Clamping the drain for coughing, vomiting, suctioning, repositioning, or in acute pain
No standardized monitoring practice of EVD site Zero EVD with manipulation of catheter and with change of position	Nursing monitoring of the EVD site and change of dressing if indicated. Zero EVD every 4 hours and with each manipulation of catheter and change of position

Preventing Infections Using Sterile Technique

Physician should don the following attire to prevent infections during insertion:

- Cap
- Mask
- Sterile gown
- Sterile gloves

In addition, it is important to limit the # of staff in a patient's room during insertion, and other staff should wear:

- Cap
- Mask
- Gloves



Questions: *Prepping and Cleansing the head*

1. Shaving or clipping?
2. Betadine or chlorhexadine?

- Cleanse head with chlorhexadine



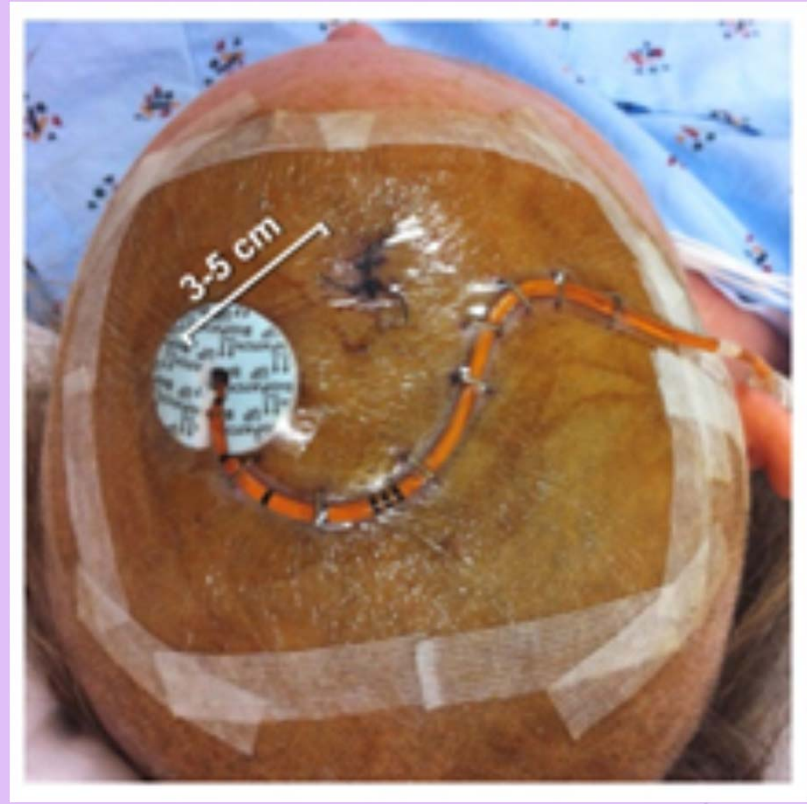
- Clip hair with clipper
No shaving.



PRE EVD Protocol



POST EVD Protocol



Nursing Responsibility when an EVD is placed

- Ensure that the appropriate equipment is available
- Monitor the integrity of the criteria in the new policy to ensure that aseptic technique has been maintained using the insertion checklist
- Level the EVD in relation to tragus of the ear



EVD Dressings

Frequency of dressing change

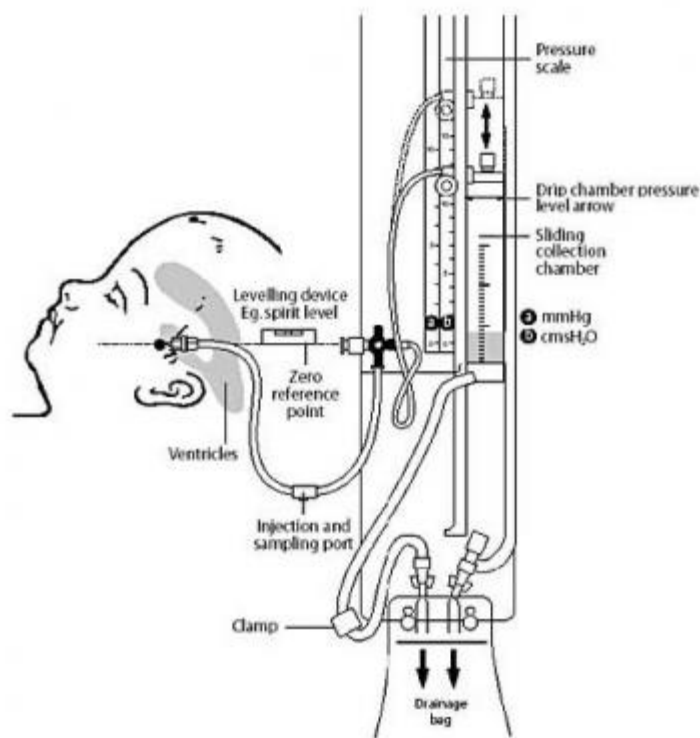
- Only change if soiled or dislodged
- No criteria exist for interval changing

When you need to change a dressing: Use of products

- Cleanse with chlorhexadine
- Reapply a Biopatch™ and bio-occlusive dressing
- Remember to retain old dressing for neurosurgery to examine

Sampling CSF

Use port that is most distal to patient



Changing Practice...

- Sample only when there is a clinical suspicion of an infection
- **NOT** daily or as per routine
- **MD or RN** can draw CSF sample

Duration of catheter placement

No strict criteria exist for catheter placement

- However, the EVD catheter should remain intact only as long as is clinically indicated in order to prevent infection

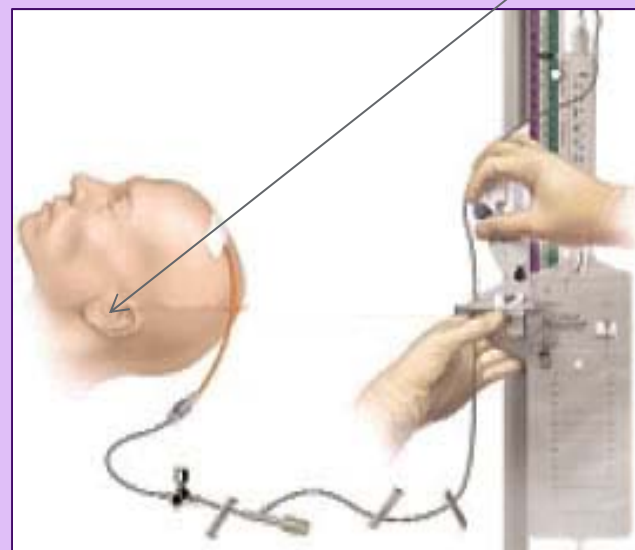
Catheter tracking

- Units will now be tracking how many days a catheter remains intact.
- Unit rounds ensure all are adhering to the new protocol

EVD Set Up



**Level EVD at the
Tragus of the ear**



Safety Compliance Monitor Unit: 12 West

Date _____ Time _____ Rounding Team _____

- EVD added to safety compliance monitor

	MR# Pt Name:	MR# Pt Name:	MR# Pt Name:	MR# Pt Name:	MR# Pt Name:	MR# Pt Name:
FALLS:						
Falls Band	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1
Patient Education	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1
Valuable hourly rounds	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1
Patient Environment	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1
Call bell within reach	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1
Toileting awareness	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1
CLABSI:						
Reason CVC is still needed						
Dressing C/D/I	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1
Date of dressing	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1
Date back check valve changed	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1
Curocap in place	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1
CAUTI:						
Reason foley is still needed						
Date of insertion on the bag	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1
Bag is below bladder and off of the floor	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1
Catheter secure	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1
Meatal Care done Q12	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1
Collection bag emptied appropriately	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1
EVD:						
Dressing: Change only when soiled or dislodged (save for Neurosurgery to assess)	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1
Drainage bag < ¼ full	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1
Tubing secure/ leak free	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1
CSF samples drawn only as indicated	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1	Y/N ___/1

Other specific items of EVD care

Your patient with an EVD needs a CT scan. What do you do with the EVD?

Turn off the CSF flow at the stopcock (on the white plate) and at the more proximal stopcock and
go to CT with the patient!

Your patient is draining into EVD bag consistently. At what point do you need to change the bag?

When bag is $\frac{3}{4}$ full

NYU Hospitals Center

External Ventricular Drainage Catheter Insertion Checklist

PATIENT LABEL HERE

Date: ____/____/____

Patient location when EVD initially inserted: _____

- New Insertion
- Reinsertion
- Reason for reinsertion: _____
- Emergent
- Non-emergent

EVD is being placed by neurosurgeon/neurosurgery resident with appropriate credentialing.

- Operator name: _____
- Observer name: _____

Critical Steps	Yes	Yes with Reminder	No -Complete PSN Report	N/A	Comments
Before procedure					
Informed consent obtained & placed in chart <ul style="list-style-type: none"> o As per standard protocol o Consenting party absent, 2 physician consent obtained 					
Time out pause and confirm completed <ul style="list-style-type: none"> o Correct patient o Correct procedure o Correct site and side o Correct patient position o Availability of correct equipment o Antibiotic administered 					
Everyone in the room performed hand hygiene					
Operator/staff in close proximity to patient					

Critical Steps	Yes	Yes with Reminder	No -Complete PSN Report	N/A	Comments
wearing sterile gloves, gowns, hats, masks					
Everyone in the room wearing hats and masks					
All equipment is prepared and placed on a bed side table/tray using aseptic technique.					
During Procedure					
Hair clipped around the site					
Skin degreased with alcohol					
Site is prepped with Chloraprep					
Sterile gloves changed between prep and drape/procedure					
Patient is covered with full sterile drape					
Catheter sutured with at least 3 sutures					
Benzoin tincture applied and skin is allowed to fully dry					
Biopatch at the skin opening					
6x8 tegaderm placed and edges secured with steri-strips					
Full gauze head wrap applied					
After procedure					
EVD tubing labeled					
CSF sample obtained by practitioner and sent immediately					

Creation of an EVD Insertion Checklist

Available within the electronic health record!



Author: Mary Beth O'Shea, SNC, ANP, 12 West

Neurosurgical Externalized Drain Fact Sheet

Prevent INFECTION: Refer to EVD Protocol prior to insertion

	Lumbar Drain	Externalized shunt	Ventricular Drain (Refer to EVD protocol)
Cause	CSF leak, NPH	Infection, obstruction	Subarachnoid hemorrhage, obstructive hydrocephalus, increased ICP, trauma
Management*	Titrate for specific amount	Titrate for amount or set at a specific level	Place at specific height in relation to level of Tragus
Parameters	None	None	ICP<20
CSF Studies	Following placement & as clinically indicated Sampling: To be drawn by MD/RN/NP/PA		

Most common management listed here, but always check MD orders.

Hourly: 1) Neuro-assessment (every hour: EVD; Lumbar drain, VP shunt as per MD order), 2) Record mL CSF in buretrol and empty into the collection bag & document on EVD flowsheet, 3) Educate patient &/or family regarding catheter care &/intra-thecal medications and document in patient education section.

Priming Drainage System (RN/MD)

- MD: Primes drainage system prior to connecting to catheter. Use sterile technique. Check that all fittings are tightened
- Turn the pressure transducer stopcock to "open" to the patient line and "open" to the Pressure transducer
- Remove sterile red cap from the pressure transducer and end cap at the catheter connection. Attach 10mL syringe, filled with preservative-free normal saline, to the transducer stopcock port and prime tubing of the patient line to the catheter connection.
- Replace sterile end cap once patient line is primed. Re-orient the stopcock "off" to the patient line.

tubing allowing 2 - 3ml of preservative free normal saline to co graduated burette.

- Turn the stopcock proximal to the drainage bag "open" to drain preservative-free normal saline into the drainage bag.
- Remove 10ml syringe into the drainage bag. Remove 10ml syringe sterile end cap.
- Do not fully drain out tube between burette and drainage bag ; can result in an in an air lock that delays draining.
- RN: Takes a transducer from the A-line setup and flushes using mL preservative-free normal saline flush
- Remove sterile red cap from pressure transducer stopcock. Att
- Turn pressure transducer stopcock to 'open' to the patient line pressure transducer (UP) [turn stopcock attached to white plate wave appears on monitor]

Zeroing:

Re-level the EVD system each time the patient moves.

The system must be zeroed to atmospheric pressure & with the tragus level with any change in patient position or transport & after system manipulation (sample collection), & when troubleshooting or there is suspected malfunction.

*Level the transducer to the tragus using a laser level.

- Turn the main stopcock (attached to the white plate) "off" to the patient line
- Open transducer stopcock to air (turn to the right) and remove
- Zero ICP on cardiac monitor.
- Return all stopcocks to the original open position to allow for CSF drainage

*Assure drain is at ordered level (at the tragus for EVD). If EVD is not zeroed

*ICP reading can be up to +/- 2mmHg from the true ICP.

TROUBLESHOOTING:

If there is no wave or CSF drainage: a) Ensure tubing is secure and not leaking, b) Check for kinks in tubing, c) Check that all stopcocks are open, d) Drop drain down to see if there is fluctuation in tubing and drainage. If no fluctuation in tubing: contact neuro-intensive or neurosurgery team as appropriate

RED FLAGS:

- Change in VS, HA, Nausea, Vomiting
- Change in CSF drainage (color, clarity)
- Leakage at insertion site or tubing

TRANSPORT:

Nursing Competency

Department of Nursing Education



COMPETENCY CHECKLIST External CSF Drainage System

NAME _____

Method

- | | | |
|---|---|---|
| <input type="checkbox"/> Direct Observation (actual) | <input type="checkbox"/> Testing (written/oral) | <input type="checkbox"/> Performance Improvement Data |
| <input type="checkbox"/> Direct Observation (simulated) | <input type="checkbox"/> Documentation Review | <input type="checkbox"/> Inservice |

Reason

- | | | | | |
|---|--------------------------------------|---|--|---|
| <input type="checkbox"/> ↑Risk, ↑Volume | <input type="checkbox"/> Age Related | <input type="checkbox"/> Patient Satisfaction | <input type="checkbox"/> Learner's Needs | <input type="checkbox"/> New Scope of Practice |
| <input type="checkbox"/> ↑Risk, ↓Volume | <input type="checkbox"/> Regulatory | <input type="checkbox"/> Infection Control | <input type="checkbox"/> Policy Change | <input type="checkbox"/> Professional Development |
| <input type="checkbox"/> New Equipment | <input type="checkbox"/> Safety | <input type="checkbox"/> Quality Related | <input type="checkbox"/> Performance Issue | |

SKILL SET: Technical Skill Interpersonal Skill Critical Thinking

COMPETENCY STATEMENT: Carries out NYULMC procedure for operating the external CSF drainage system



NYU Hospitals Center
Department of Neurosciences
Departmental Process Standard

Date: 2-3-15

PROCEDURE FOR: Set up and maintenance of the External Cerebrospinal Fluid Drainage and Monitoring System

PURPOSE(S): To ensure appropriate set up and maintenance of the External Cerebrospinal Fluid Drainage and Monitoring System

SUPPORTIVE DATA:

1. External Ventricular Drain (EVD) is a closed sterile system that is placed in the lateral ventricle to drain cerebrospinal fluid (CSF). Ventricular catheter is placed by neurosurgeons/neurosurgery residents under sterile conditions. The catheter is then connected to the External CSF Drainage and Monitoring System.
2. EVD facilitate therapeutic CSF drainage and is the gold standard for intracranial pressure (ICP) measurement.

NYUMC Externalized Ventricular Drain Protocol and Procedures

Procedures: EVD insertion, Sampling CSF, Intrathecal medications, EVD troubleshooting, EVD weaning, EVD removal

EVD INSERTION:

Pre-procedural Preparation:

1. EVDs may only be placed by neurosurgery residents with appropriate credentialing, or under the direct observation of a neurosurgeon who has appropriate credentialing.
2. Informed written or telephonic consent must be obtained per standard hospital policy. In the emergent setting without a consenting party, 2-physician consent must be performed by the performing/observing neurosurgeon and another attending physician.
3. A detailed medication history should be obtained focusing on the use of:
 - a. Platelet inhibitors (aspirin, clopidogrel, dipyridamole)
 - b. Vitamin K antagonists (warfarin)
 - c. Thrombin inhibitors (argatroban, dabigatran)
 - d. Xa Inhibitors (heparin, LMWH, fondaparinux, rivaroxaban, apixaban)
4. Obtain a coagulation profile and CBC to ensure the following goals are met:
INR < 1.5, PTT < 40, platelets > 100,000.

Establishment of an external ventricular drain (EVD) best practice guideline: The quest for a comprehensive, universal standard for EVD care

March 3, 2015

Problem: External ventricular drains (EVDs) are devices commonly used in neurocritical care. Despite a high risk of ventriculostomy-related infection (upward of 45%), many hospitals including NYULMC lack strict protocols for EVD placement and maintenance. Additionally, EVD infections are typically not tracked with the same diligence as central line related bloodstream infections or catheter related urinary tract infections.

Project goal: To achieve a 0% ventriculostomy-related infection rate

Team members and roles:

Team Leader: Ariane Lewis, MD, Neurocritical Care

Irina Dynkevich, RN, SSN, 12 West; Fabio Frisoli, MD, Neurosurgery; John Golfinos, MD, Neurosurgery; Millie Hepburn, RN, Nurse Educator, Neurosciences; Nancy Jones, RN, NM 12 West; Aaron Lord, MD, Neurocritical Care; Donato Pacione, MD, Neurosurgery; Michael Phillips, MD, Infection Control; Marina Spektor, RN, SSN, 12 West; Jeffrey Wisoff, MD, Neurosurgery

Interventions:

- Development of MD and RN protocols for EVD insertion, care and maintenance
- Initiation of change in frequency of cerebrospinal fluid (CSF) sampling from EVDs
- Acquisition of antibiotic coated EVD catheters
- Creation of an EVD placement checklist
- Creation of an EVD audit log
- Establishment of a definition of ventriculostomy-related infection
- Facilitation of a method for Infection Control to track ventriculostomy-related infections

Progress to date: Nursing and Physician education and protocol implementation underway in Spring 2015

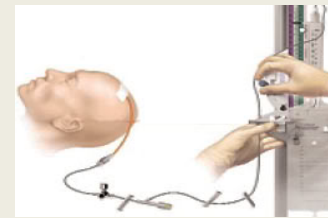
Baseline Data:

-57 EVDs 1/1/13-7/1/14 → 7 excluded (6 due to CSF infection before EVD placement & 1 with a positive CSF culture made comfort care before determining if it was an infection or a contaminant)

-379 EVD days
-414 CSF cultures

-9 patients (18%) with positive CSF cultures

-4 patients (8%) met criteria for ventriculostomy-related infection
-5 patients (10%) with positive cultures felt to be contaminants



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Lessons learned:

- It is necessary to be transparent regarding practice shortcomings and determine aspects of care that require modification.
- Institutions that develop a meticulous standardized protocol for EVD insertion, maintenance and management have reported reduction in frequency of infection.
- Vigilant and consistent monitoring is integral to success.
- Specific aspects of EVD insertion and maintenance have dramatic influence on EVD related infection rates.
- Improvements in infection rates must be organized by multidisciplinary teams.
- Frequent education and reeducation sessions about EVD maintenance and infection prevention promotes understanding of risk factors for infection and compliance with protocols.

Next steps: Implement the protocol then monitor rates of infection

Project Contacts:

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EVD workgroup:

This project was driven by Research and Recommendations by:

- *NeuroSurgery ICU Nurses*
- *Pediatric ICU Nurses*
- *Neurointensivists*
- *Neurosurgeons*
- *Pediatric Neurologists*

A glowing blue brain is held gently in two hands, symbolizing care and protection. The brain is the central focus, with a bright blue, almost ethereal glow. The hands are rendered in a soft, realistic style with a pinkish-red hue, suggesting warmth and human touch. The background is a dark, muted purple, which makes the glowing brain and hands stand out prominently.

Thank you for keeping our
neuroscience patients safe
and free from infection!