Group arrangements:
Salford Royal NHS Foundation Trust (SRFT)
Pennine Acute Hospitals NHS Trust (PAT)

Northern Care Alliance NHS Group

External Ventricular Drain (EVD) Insertion and Management

Lead Author:	Emma Parkin – Advanced Critical Care Practitioner
Additional author(s)	Daniel Holsgrove – Consultant Neurosurgeon Hiren Patel – Consultant Neurosurgeon Adam Jeans – Consultant Microbiologist Alex Peel – Consultant Microbiologist Sarah Niland – Advanced Practitioner Sarah Davies – Advanced Practitioner Louise Dulhanty - SAH Specialist Nurse
Division/ Department::	Neurosurgery
Applies to:	Salford Royal Care Organisation
Date approved:	November 2018
Expiry date:	November 2021

* This includes documents relevant to multiple Care Organisations, Corporate and Support Services

Contents

Group arrangements:
Salford Royal NHS Foundation Trust (SRFT)
Pennine Acute Hospitals NHS Trust (PAT)

NHS
Northern Care Alliance
NHS Group

1. What is this policy about?

1.1 The aim of this policy is to standardise the insertion, management and care of external ventricular drains.

If you have any concerns about the content of this document please contact the author or advise the Document Control Administrator.

2. Where will this document be used?

2.1 This documents should be used by Neurosurgery, Critical Care and Theatres. Recovery, with particular reference to the following staff groups:

- Consultant Neurosurgeons
- Consultant Microbiologists
- Consultant Anaesthetists/Intensivists
- Advanced Practitioners in Neurosurgery and Critical Care
- Trainee medical staff, neurosurgery and critical care
- Nursing Staff (Critical Care)
- Nursing Staff (Neurosurgical Wards)
- Nursing and ODP Staff (Neurosurgical Theatres)
- Neurosurgical surgical site surveillance nurse
- Infection Control Team

2.2 This document applies only to patients who have an EVD inserted

3. Why is this document important?

3.1 This clinical guideline applies to all staff who are involved in the care of a patient who has an External Ventricular Drain (EVD) in situ. The guideline provides a standardised approach to insertion and management of an EVD in order to enhance patient safety and minimise the risk of infection.

4. What is new in this version?

- Regular hand hygiene and nail cleaning for all patients
- Coloured pillow cases for the head of each patient
- EVD bed head
- Mandatory EVD education for nurses
- Links to new quick reference guides for:
  Sampling EVDs
  Flushing EVDs
  Administration of IT antibiotics
  Removal of the EVD

5. Guideline

Key Messages

- All patients with an external ventricular drain will be managed according to this clinical guideline.
- Nursing staff caring for patients with EVDs should have completed the appropriate competency document, and annual update.
- All staff attending to sample, flush or give intrathecal antibiotics via an EVD system must be appropriately trained and should follow the quick reference guides link's

Administering intrathecal (IT) antibiotics via an EVD QRG
CSF sampling from External ventricular drain QRG
Removal of an External ventricular drain QRG
Flushing of External ventricular drain QRG

- All staff involved in the insertion and management of EVD systems must be compliant with the aseptic no touch technique (ANTT) mandatory training.
- Under **NO** circumstances should an EVD be pushed back if found to have become fully or partially displaced.
- Cerebro-spinal fluid (CSF) leaks or a blocked EVD must be reported immediately and attended to within **1 hour** by a Neurosurgeon or other appropriately trained staff.

5.1 EVD Insertion

5.1.1. Basic Principles

The procedure must be performed by a Neurosurgical trainee who has been assessed as competent in the procedure, or under supervision by a senior Neurosurgeon. In addition to theatre standard procedures, the following must be adhered to:

- Whenever possible the patient's hair should be washed prior to this procedure to minimise the risk of infection.
- The procedure must be carried out in a neurosurgical theatre on an operating table. Operating on the patient's bed may encourage an unsterile field and should be avoided whenever possible.
- Avoid inserting an EVD in a theatre previously used to treat a patient with a contaminated wound (e.g. bowel surgery) as this may increase the risk of infection of the catheter.
- The number of theatre staff must be minimised. Any person inside theatre must wear appropriate attire at all times.
- All patients must have their MRSA status and allergies checked and documented.
- All patients must receive antibiotic prophylaxis in accordance with the Trust Antibiotic Prophylaxis in Cranial Neurosurgery policy (link)

When the EVD is being inserted as an ACUTE EMERGENCY, the procedure should not be delayed for any reason.

5.1.2 Insertion Guidance

- Consent for this procedure is as per the Trust Consent Policy (link)
- The procedure MUST be image-guided (Brainlab/ultrasound), unless clinical urgency precludes this.
- If the pre-op scan suggests the procedure may be a difficult cannulation, the operator must discuss the insertion with a Consultant Neurosurgeon first.
- If the ventricle is not cannulated within **3 passes** a senior neurosurgeon must be contacted to attend theatres and provide support.
- If the ventricle has not been cannulated at 5cm depth, then a new trajectory should be considered.

5.1.3 Procedural Guidance

Preparation of the patient.

The patient's hair must be clipped, both at the burr hole incision site as well as the planned EVD exit site, to allow a dressing to adhere after the operation. Prepare the skin using Chlorhexidine 0.5% or Alcoholic Betadine and infiltrate with local anaesthetic.

Choosing the operation site.
EVDs must NOT be inserted through infected skin. If an *infected* EVD is to be replaced, the same burr hole should not be used. Both the site of the incision for the burr hole and the exit site of the EVD must be marked prior to the operation. The EVD will be subcutaneously tunnelled at least 6cm away from the main incision site. Adequate tunnelling will slow down the colonisation of the implanted EVD section and decrease the risk of CSF leak from the exit site.

Closing the wound
To close a new wound, use interrupted vicryl sutures to the galea aponeurotica and clips or a non-absorbable monofilament suture to the skin. The EVD will be secured by underrunning it. The loop needs to be fixed to the scalp with sutures. A transparent dressing will be applied to the wound and EVD exit site after careful drying. If closing an old wound, clips should NOT be used. Rather, interrupted full thickness simple sutures (non-absorbable, monofilament) will be used. A dressing will be applied to the wound and EVD exit site after careful drying.

Microbiology
CSF samples will be sent for microbiology and biochemistry regardless of the indication for EVD insertion. CSF samples sent during the insertion will help identify ongoing medical conditions and trace the origin/start of ventriculostomy-associated infection.

Attaching the EVD drainage system
The drainage system will be attached in theatre while the patient is still draped. The drainage level should be set at the prescribed level. While the patient is being transferred to his/her bed, the EVD may be kept clamped. However, the EVD should be re-opened soon thereafter and it is the operating surgeon's responsibility to ensure that the system is patent and draining after insertion.

Post-surgical instructions
The operation note should document the level at which the EVD is to be set. This should also be clearly communicated to the post-op ward nurse. The EPR flow sheet capturing details of the EVD insertion must be completed by the surgeon on EPR post procedure.

The Nursing staff who are caring for patients receiving antimicrobial treatment to prevent MRSA colonisation should ensure that Prontoderm is applied thoroughly to patient hair, to ensure sufficient coverage.

5.1.4 Attaching the EVD system

- The drainage system will be attached in theatre by the operator while the sterile field remains intact, and set at the desired level as determined by the neurosurgeon.

- When being transferred from table to bed, the EVD must be clamped and kept in an upright position at **ALL** times. This ensures the drainage of CSF is not excessive and that the filter in the EVD system does not become contaminated with CSF.
- Once the system has been zeroed, the EVD should be re-opened as soon as possible
- It is the operating surgeon's responsibility to ensure that the system is patent and draining after insertion.
- Prior to the patient emerging from anaesthesia their hands should be washed with soap and water and nails cleaned

5.2 Post-surgical Instructions

The **Operation note** should be completed on EPR within 1hour and should specify the required EVD height. The operation note should be documented using the approved acronym expander.

The **EVD pathway** should be commenced in recovery.

5.3 Managing the EVD during transportation

- When transporting the patient the EVD system must remain at the prescribed level and must not be laid flat. If the system is inverted then the reflux vent and it's filter will become wet and ineffective. This will cause backward flow of CSF, entry of microbes into the system and may potentially obstruct CSF drainage.
- If there is a concern that the filter has become wet, this should be reported to the neurosurgical team who can consider whether to replace the drainage system.
- The drain should be clamped, handled and unclamped by an allocated person when transferring/sliding the patient (e.g. from bed to trolley).

5.4 EVD Management

- The EVD care pathway must be used to document EVD management by the multi professional team.
- A green-coloured pillow case should be used on one pillow which has been designated as the pillow to be used under the patient's head. This pillow MUST NOT be used elsewhere on the patient to support positioning. The pillow case/ pillow must be changed if soiled.
- If a coloured pillow cases are not available, then a fresh clean pillow case must always be placed under the head of the patient.

- Incontinence pads should **NOT** be used under the head of a patient with an EVD in situ.
- Patient's hands must be washed at least 3 times a day with soap and water and dirty nails cleaned with single use nail brush once per day
- The EVD site must be covered with a semi permeable, transparent adhesive dressing at all times. This dressing should be inspected 3 times daily and the outcome should be documented in EVD pathway.
- Dressings covering the wound and EVD exit site should remain intact and should be changed **every 7 days**, unless it has become soiled, has a collection of fluid below and/or has become loose.
- If the dressing needs to be replaced utilise a strict ANTT procedure and clean the site with 0.9% Sodium Chloride prior, ensuring the site is dried thoroughly prior to re-applying the dressing.
- If a patient is receiving prontoderm either as prophylaxis or treatment it can be used and combed through hair, although there needs to caution not to catch or dislodge the EVD.
- Patients hair should **never** be washed whilst an EVD is insitu

5.5 Identifying and managing CSF leaks

5.5.1 Identifying a CSF leak

- Any wetness underneath the dressing must be reported immediately to ward medical team, or on-call neurosurgeon outside normal working hours.

5.5.2 Management of the CSF leak

- Any CSF leak should be attended to **within 1 hour** of being identified and if not dealt with within this time a datix should be submitted to allow investigation.
- The source of the leak should be identified and sutured rather than just lowering the prescribed drain height.
- Document the name of the doctor or advanced practitioner and the time they were contacted on the EVD pathway.

5.6 Monitoring patients with an EVD in situ

- All patients must be monitored using the Glasgow Coma Scale (GCS).
- The frequency of observations will be dependent upon the clinical condition, but should be at least 4 hourly. EVD observations should be taken hourly. See section 5.8.

- Temperature should be taken regularly (at least 4 hourly) and pyrexia (>38.3 °C) should be reported to the medical staff.
- The exit site dressing should not be taken down unless visibly dirty or infection is suspected and in this case the exit site should be swabbed and sent for culture and sensitivity. The dressing should not be disturbed for routine swabbing.

5.7 Positioning of the EVD

5.7.1 Positioning

- EVD's should be mounted on an EVD specific drip stand by the side of the patient.
- Conscious patients with an EVD in situ must be advised to alert the nurse if the wish to be re-positioned such that appropriate management of the drainage device can be undertaken during patient movement.

5.7.2 Setting the height of the EVD (pressure level) of the EVD

- The drain is set at a level pre-determined by the neurosurgical team. This is will be documented on the EVD pathway and operation note.
- An accurate zero level should be set by using a spirit level.
- Any change to the prescribed height should be documented in the electronic patient record and in the EVD pathway.
- All patients should have a bed head sign on the drip stand with the EVD.

5.7.3 Re-positioning the patient with an EVD in insitu

- One person should be allocated to look after all aspects of drain care during positioning.
- Prior to handling the EVD, the allocated person must wash their hands and don appropriate PPE (gloves and apron).
- The drain should be clamped prior to re-positioning. Once re-positioned, the allocated person must re-zero the drain (using a spirit level) at the external meatus/tragus **PRIOR** to unclamping it.

5.8 Monitoring EVD input/output

The average hourly drainage is 10-15 ml.

All EVD input and output is recorded on the EVD pathway hourly.

5.9 Ensuring patency of the EVD

When the EVD system is patent, CSF will drain into the collecting bag and the fluid level will 'oscillate' – this means the fluid level will swing up and down in the catheter. If no drainage occurs:

- Check the drain is in the correct position and has not migrated partially or fully out from the insertion point.
- Check for CSF oscillation.
- Check for blockage, kinks or closed stopcocks.
- Inspect the sutures to ensure they are not restricting the patency of the catheter.

If drainage has not occurred, but the catheter is oscillating and the chamber is at the correct level, then the pressure in the ventricles may be within normal limits. In this instance the meniscus of the CSF will be seen to oscillate (swing) because of the pulsatile pressure. This is normal and is recorded on the EVD output chart as 'osc' (oscillating).

If there is no oscillation (swinging) in the system, then the drain is blocked and hydrocephalus is likely to develop. Contact the neurosurgical staff **immediately** to attend and take action to unblock the catheter within one hour of identification.

If the catheter requires flushing see section 5.10.

5.10 Management of a blocked EVD

If the EVD is blocked, the attempts should be made in the first instance to aspirate CSF from the catheter.

Aspirating CSF from the EVD must only be undertaken by health care professionals who have been trained and assessed as competent in the procedure. The task should be performed as detailed in the Flushing of External ventricular drain QRG (link)

5.11 Sampling the CSF for Culture and Sensitivity and Identifying Infection

5.11.1 Sampling of CSF for culture and sensitivity

A sample should only be taken when there is a clinical suspicion of CSF infection following discussion with the senior neurosurgeon caring for the patient.

Sampling must only be undertaken by a health care professional who has been trained and assessed as competent in the procedure and should be performed as described in the 'CSF sampling from External ventricular drain QRG (link)

5.11.2 Identifying EVD related (CSF) infection

There is no internationally agreed definition of CSF infection. Infection in the presence of an EVD may be a device related issue and both the clinical picture and microbiological results must be considered in order to rule out contamination and make a reliable diagnosis of EVD related infection.

EVD related ventriculitis is defined as:

1. Cerebrospinal fluid (CSF) is sterile at the time of insertion.
2. CSF from the EVD becomes positive on culture microscopy (definite infection)
3. Antimicrobial therapy is initiated to treat CSF infection (intrathecal and/or intravenous administration) - whether infection is confirmed or suspected (probable infection)

EVD related infection rates will be monitored by the Surgical Site Infection (SSI) Nurse.

Suspected EVD related infections should be reported via datix on the microbiology ward round. This will trigger the undertaking of a Root cause Analysis (RCA).

5.12 Administration of Intrathecal antibiotics

Both the on-call Microbiologist and Pharmacist must be consulted prior to commencing treatment with intrathecal antibiotics. Ensure that any antibiotics intended for intrathecal administration are at room temperature before administering.

A stat dose should be prescribed and given at the time the infection is discovered and prescribed for 10am each day thereafter.

Follow the quick reference guide for the administration procedure link

Administering intrathecal (IT) antibiotics via an EVD QRG link

5.13 Removing the EVD

The decision to remove the drain is undertaken by the neurosurgical team. The drain may be clamped for a predetermined length of time (for example 12-24 hours) prior to removal, at the instruction of a clinician.

Refer to the 'Removal of an External ventricular drain QRG (Link)

5.14 Accidental breach of system (severing of EVD, fracture or reservoir)

It is essential to maintain a closed system at all times. If the system is breached:

- Clamp the catheter that remains attached to the patient with non-traumatic clamps (forceps) to prevent uncontrolled free drainage CSF from the patient.
- Wrap the cut area of the catheter that remains attached to the patient in a sterile gauze swab to prevent free flow of CSF and potential subdural haemorrhage.
- Inform the Neurosurgical team Immediately - **Stop all oral / NG feeds.** Urgent action is required to re-establish a closed system of drainage. The EVD must be replaced (through the same burr hole unless otherwise indicated).
- Monitor the patient closely using the GCS.

5.15 Change of EVD to Shunt ("Internalisation")

The decision to convert an EVD to a shunt is made by the neurosurgical team. Once the decision is made, the procedure should be considered as a priority and be performed within 24hours.

Prior to procedure:
Ensure valid consent has been obtained.

Using the procedures described above:

1. Collect CSF for culture 2-3 days before the procedure from a port or the Omaya reservoir if fitted (not the bag) to ensure CSF is sterile.

6. Roles and responsibilities

6.1 Ward Managers/matrons

- Establish access to appropriate equipment (single use drip stands etc)
- The EVD workbook is completed by all staff caring for patients with EVD's and is mandatory on the skills matrix and have access the appropriate education and training
- Ensure assessment and care of the patients is undertaken by competent staff
- Ensure any EVD adverse incidents are reported in a timely manner
- Participate in investigating adverse incidents and implementing actions as required

6.2 Neurosurgeons

- Ensure that all medical staff involved in the insertion or care of an EVD are aware of the policy and its content
- Monitor compliance with the policy
- Report and investigate policy non-compliance
- Report trends regarding policy compliance to neurosurgical and the neuro critical care governance meetings

6.3 Surgical Site infection Nurse

- Report EVD related infection rates back to neurosurgical and the neuro critical care governance meetings.
- Monitor compliance with policy and report back to neuro and the neuro critical care governance meetings

7. Monitoring document effectiveness

7.1

Measurements

- The EVD bundle of care should be regularly audited by each ward at least monthly.

- Any leaks that are not dealt with within 1hour should be escalated via the datix system and this will be fed back at governance meeting.

- All EVD related infections should have an RCA completed and presented back appropriate infection control or governance meeting depending on directorate structure.

Team responsible for monitoring:

- Monitoring should be the combined responsibilities of the ward managers and surgical site surveillance nurse

Frequency of monitoring:

- Monthly

Process for reviewing results and ensuring improvements in performance:

- Through the EVD QI project and governance structure

8. Abbreviations and definitions

EVD – external ventricular drain
ANTT – aseptic no touch technique
CSF – cerebrospinal fluid
EPR – electronic patient record
IFM - Interventricular Foramen of Munro

9. References and Supporting Documents

9.1

Fried, Herbert et el (2016) The insertion and management of external ventricular drains: An evidence-based consensus statement. Neuro critical care. Vol 24. Pg 61-81

9.2 Related SRFT/PAT documents

Flushing an EVD - Quick reference guide (link)

Sampling an EVD – Quick reference guide (Link)

Administering Intrathecal antibiotics – Quick reference guide Link

Removing an EVD – Quick reference guide (Link)

10. Document Control Information

It is the author's responsibility to ensure that all sections below are completed in relation to this version of the document prior to submission for upload.

Remove instructions once completed.

Nominated Lead author:	Emma Parkin		Advanced Critical Care Practitioner		
Lead author contact details:	0161 2065045		Emma.parkin@srft.nhs.uk		
Lead Author's Manager:	Wendy Aubrey		Intensive Care Consultant		
Applies to:	Please indicate which Care Organisation(s) this document applies to:				
	Salford CO X	Oldham CO	North Manchester CO	Bury & Rochdale CO	Northern Care Alliance Group (NCA)
Document developed in consultation with :	The development of this policy has been in consultation with the EVD QI group. Within this group there are medical, nursing and AHP representatives from neurosurgery, theatres critical care and recovery staff. In addition to this colleagues from anaesthetics have also been involved in the governance process through neurosurgical governance.				
Keywords/ phrases:	External ventricular drain, EVD				
Communication plan:	It will disseminated through clinical governance through the ward managers, neurosurgeons and critical care team				
Document review arrangements:	This document will be reviewed in November 2021				
Approval:					
	Neurosurgical Governance Committee Critical Care Governance Committee				
	Insert full approval date: 20/11/2018				
How approved:	Chair's actions		Formal Committee decision X		

11. Equality Impact Assessment (EqIA) screening tool

Legislation requires that our documents consider the potential to affect groups differently, and eliminate or minimise this where possible. This process helps to reduce health inequalities by identifying where steps can be taken to ensure the same access, experience and outcomes are achieved across all groups of people. This may require you to do things differently for some groups to reduce any potential differences.

1a) Have you undertaken any consultation/ involvement with service users, staff or other groups in relation to this document? If yes, specify what.	***no***
1b) Have any amendments been made as a result? If yes, specify what.	***no***

2) Does this policy have the potential to affect any of the groups listed below differently?
Place an X in the appropriate box: *Yes, No or Unsure*
This may be linked to access, how the process/procedure is experienced, and/or intended outcomes. Prompts for consideration are provided, but are not an exhaustive list.

Protected Group	Yes	No	Unsure
Age – *under 18's excluded*	**X**		
Sex *(e.g. is gender neutral language used in the way the policy or information leaflet is written?)*		**X**	
Race *(e.g. any specific needs identified for certain groups such as dress, diet, individual care needs? Are interpretation and translation services required and do staff know how to book these?)*		**X**	
Religion & Belief *(e.g. Jehovah Witness stance on blood transfusions; dietary needs that may conflict with medication offered.)*		**X**	
Sexual orientation *(e.g. is inclusive language used? Are there different access/prevalence rates?)*		**X**	
Pregnancy & Maternity *(e.g. are procedures suitable for pregnant and/or breastfeeding women?)*		**X**	
Marital status/civil partnership *(e.g. would there be any difference because the individual is/is not married/in a civil partnership?)*		**X**	
Gender Reassignment *(e.g. are there particular tests related to gender? Is confidentiality of the patient or staff member maintained?)*		**X**	
Human Rights *(e.g. does it uphold the principles of Fairness, Respect, Equality, Dignity and Autonomy?)*		**X**	
Carers *(e.g. is sufficient notice built in so can take time off work to attend appointment?)*		**X**	
Socio/economic *(e.g. would there be any requirement or expectation that may not be able to be met by those on low or limited income, such as costs incurred?)*		**X**	
Disability *(e.g. are information/questionnaires/consent forms available in different formats upon request? Are waiting areas suitable?) Includes hearing and/or visual impairments, physical disability, neurodevelopmental impairments e.g. autism, mental health conditions, and long term conditions e.g. cancer.*		**X**	

Are there any adjustments that need to be made to ensure that people with disabilities have the same access to and outcomes from the service or employment activities as those without disabilities? *(e.g. allow extra time for appointments, allow advocates to be present in the room, having access to visual aids, removing requirement to wait in unsuitable environments, etc.)*		**X**	

3) Where you have identified that there are potential differences, what steps have you taken to mitigate these?

No

4) Where you have identified adjustments would need to be made for those with disabilities, what action has been taken?

n/a

Will this policy require a full impact assessment? Yes / No
(*a full impact assessment will be required if you are unsure of the potential to affect a group differently, or if you believe there is a potential for it to affect a group differently and do not know how to mitigate against this - Please contact the Inclusion and Equality team for advice on* equality@pat.nhs.uk)

Author: Type/sign: Emma Parkin Date: 9/5/18

Sign off from Equality Champion: Date:

12. Appendices

Appendix 1 - Monitoring