Catheter Migration / Malposition

Complication	Device	Signs and Symptoms	Cause	Prevention	Action
Catheter migration /malposition	All CVADs	• Dacron cuff visible outside skin tunnel and/or increased external catheter length. • 'Ear gurgling' when catheter is flushed. • Arrhythmias, headache / chest / back / shoulder pain with infusion • Signs of extravasation • Ipsilateral extremity oedema	• Secondary intravascular malposition of CVADs, also known as tip migration, can occur at any time during the dwell and is related to sporadic changes in intrathoracic pressure (e.g., coughing, vomiting); original tip located high in the SVC; DVT; congestive heart failure; neck or arm movement; and positive pressure ventilation. • Forceful flushing • Inadequate securement of the device • Disconnection of securement device. • Incorrect removal of dressings.	• Adequate securement of catheter • Patient and staff education on best practice guidelines	• Never re-advance a catheter that has migrated externally. • CXR or ECG tip confirmation on CVAD placement to confirm correct tip position. Repeat CXR should migration be suspected or occur after placement. • If the CVAD tip is not in the correct position (e.g., the tip is not in the lower third of the superior vena cava (SVC) at the cavo-atrial junction (CAJ) or in the upper right atrium (RA) it should be replaced.

Persistent Withdrawal Occlusion (PWO)

Complication	Device	Signs and Symptoms	Cause	Prevention	Action
Persistent withdrawal occlusion (PWO)	All CVADs and Midlines	The inability to aspirate blood, but still able to instil fluid	• Malposition of catheter tip due to incorrect placement or migration after placement • Catheter tip abutting the vein wall restricting aspiration. • Fibrin sheath around catheter tip. • Pinch off syndrome (if subclavian placement)	• Placement of catheter tip at cavo-atrial junction. • Correct securement to prevent migration. • Routine flushing of catheter as per manufacturers IFU with correct flushing technique (push/ pause and positive pressure) when disconnecting syringe after flushing the catheter, or removing a port needle. • Ensure VAD is always flushed with 0.9% sodium chloride after any attempt to aspirate blood • PWO Can lead to complete occlusion so treat early.	• Get patient to change position/cough to alter intrathoracic pressure and alter tip position. • If subclavian insertion, ask patient to lift arm on side of catheter placement to exclude 'pinch off' syndrome. • Confirm correct tip position on chest X-ray / Fluoroscopy before use of VAD • Challenge affected lumen with 250mls normal saline over 15 minutes via a pump to test for patency. (Caution in fluid/sodium restricted patients) • Do not use VAD for drug administration if patency cannot be confirmed • Use of thrombolytic agents to disperse fibrin sheath as per hospital policy or consider infusion if this fails[2] • Removal / replacement of the catheter may be required[2]. • Request support from vascular access service, if available • Consider discussion with IR for a lineogram.

Complete Catheter Occlusion

Complication	Device	Signs and Symptoms	Cause	Prevention	Action
Complete catheter Occlusion	All CVADs	The inability to both aspirate blood and infuse fluid.	• Possible thrombus formation within catheter lumen, the catheter can become blocked if not correctly or adequately flushed, especially after blood sampling. • Solution precipitate, the catheter can become blocked if fluids are incompatible. • The catheter is kinked. • Catheter migration: The catheter tip is in the incorrect position.	• Use proper flushing and locking procedures[2] (i.e. Push / pause positive pressure technique when disconnecting syringes) • Assess VAD patency by aspirating for blood return and flush each lumen prior to administering any solution[2]. • Effective flushing of VAD between and after drug administration, or blood sampling to prevent build-up of precipitate in catheter lumen.	• Manipulation of clamp and site to check line is not kinked or clamped. • Consider replacing needle free device and dressing in case of kinking of the catheter using ANTT or other standardised technique. • Gently attempt to flush with saline using push/pull technique, always with a 10ml syringe, NEVER use force to flush a catheter as this can result in catheter fracture and potential embolus. • Confirm correct tip position on chest X-ray. • Use of thrombolytic agent (as per hospital policy) using either 3-way tap technique or bolus to instil thrombolytic agent or to dissolve precipitate[16]. • Consider discussion with Interventional Radiology for a lineogram. • Removal / replacement of the catheter may be required. • Recognize that bacteria may adhere to thrombi in and around the CVAD, increasing the risk of potential infection.

Compartment Syndrome

Complication	Device	Signs and Symptoms	Cause	Prevention	Action
Compartment Syndrome	PIVC, PICC, Midline	• More prevalent in PICC's placed in the antecubital fossa. • Hand/arm: Numb, tingling & cyanosed. • Occurs within 24 hours of PICC insertion.	• Fluid accumulating in the tissue can lead to nerve compression injuries. Fluid can originate from infiltrated IV solutions, hematoma, and oedema associated with the inflammatory process of phlebitis and thrombophlebitis[2]. • Structures at risk: median and ulnar nerves; radial and ulnar arteries.	• Use ultrasound for placement to prevent inadvertent puncture of artery.	• Treatment is ESSENTIAL and URGENT for surgical relief of pressure. • Use appropriate means to control bleeding at attempted and successful sites to reduce the risk of hematoma that can lead to nerve injury due to compression[2]. • Urgent decompression is required to prevent severe ischaemia. • Early referral for assessment as per hospital policy (i.e. orthopaedics/ plastics team) and continuous compartment pressure monitoring are required.

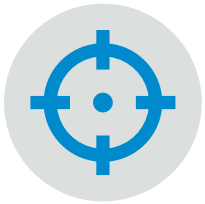
Infiltration and Extravasation

Complication	Device	Signs and Symptoms	Cause	Prevention	Action
Infiltration and Extravasation **Definition:** **Infiltration:** inadvertent administration of non-vesicant medication or solution into the surrounding subcutaneous or subdermal tissue instead of the intended vascular pathway[4]. **Extravasation:** inadvertent administration of vesicant medication or solution into the surrounding subcutaneous or subdermal tissue instead of the intended vascular pathway[4].	All VAD's	Infiltration / Extravasation should be suspected if any of these symptoms are present: • Evidence of induration, erythema, swelling, altered sensation, tightness of the skin or leakage around a PIVC site, at exit site or along skin tunnel of CVAD at exit site or around TIVAD insertion pocket[2] • The patient complains of burning, stinging, pain or any acute change around the VAD site, entry or exit site of a CVAD, along any part of the skin tunnelled section or around the site of an implanted TIVAD[2] • Patients may be at higher risk due to sedation, altered sensation, mental status or cognition require frequent monitoring of the site[2]	• Catheter fracture in the skin tunnel • Dislodgement of PIVC or TIVAD needle • Inadequate securement or bandaging of site. • Venous thrombosis or stenosis proximal to insertion site • Fibrin sheath formation along the catheter to the exit site	• Provide education to patients, caregivers and healthcare professions. • Always use a 10ml syringe or larger - do not apply force flush if resistance felt • Assess ability to aspirate blood return and no resistance to flushing prior to use. • Correct positioning of TIVAD needle • Adequate anchorage of TIVAD needle • Confirmation of catheter patency (using 0.9% sodium chloride or other compatible fluid), before use	• Provide education to the patient and caregivers to report any pain at the site. • Early recognition and prompt management is vital. • Immediately stop the infusion and initiate appropriate interventions according to your Trust extravasation policy[2]. • **General Principles:** [2pS143] - Aspirate if possible (do not aspirate contrast media) - Do not flush VAD. - Assess site, outline the area suspected. - Avoid pressure to the site. - Elevate limb (if appropriate) . - Photograph the area. - Estimate the volume of solution infiltrated / extravasated. - Remove VAD once the appropriate intervention has been initiated and keep for investigation (if appropriate) - Do not use affected extremity for subsequent VAD insertion wherever possible. • Extravasation of a vesicant drug must be treated as a medical emergency.

NIVAS Infiltration and Extravasation Strategy

Prevention

Safe IV therapy administration and vascular access practice is essential to preventing infiltration and extravasation occurring in the first instance. All healthcare professionals involved in the delivery of intravenous therapies and the use of vascular access devices should be aware of the preventative measures associated with infiltration and extravasation, vessel health and preservation and the principles of vascular access.



Recognition

Recognising the early stages of extravasation is vital, early diagnosis can reduce the amount of damage done to the patient's tissue.

Treatment

Early intervention and treatment to reduce or stop tissue damage. Hot or cold compress, injectable antidotes, tissue wash out and referral to plastics should be considered as part of the treatment pathway for extravasation.

Follow-up

Ensure the patient is followed up the appropriate department, either IVAS, Plastics or tissue viability and supported. Clinical photography should be used to continuously document the extravasation injury. The patient may need psychological support depending on the extent of the injury. Social support may also be necessary on discharge.

Reporting

Standardised local incident reporting of the infiltration and extravasation should be undertaken.

Catheter fracture / Air embolus / Catheter embolus

Complication	Device	Signs and Symptoms	Cause	Prevention	Action
Catheter fracture / Air embolus / Catheter embolus	All VAD's	• Damage to the catheter may be visible, such as fluid leaking out or air bubbles in syringe if withdrawing fluid[2]. • If embolised, patient may looks unwell with obvious signs of shock[2] • Extreme shortness of breath or cyanosis, hypotension, tachycardia[2] • Be aware of catheter pinch-off and potential for fracture if catheter has been inserted via subclavian vein[2].	• Re-sheathing of PIVC stylet during insertion[2] • Damage to CVAD caused by forceful flushing. • Incorrect CVAD removal technique • Use of scissors or blades. • Non-priming of extension sets. • Using a non-power rated catheter for CT/MRI injection[2].	• Never re-sheath a stylete[2] • Avoid frequent bending or friction against the catheter (e.g., rotate location pf integrated clamp/s)[2]. • Don't pull or stretch CVAD during removal, if resistance felt on removing catheter STOP, rest, relax, heat, 0.9% sodium chloride flush and then restart slowly. • Tunnelled CVCs to be removed by experienced practitioner (cut down) • No syringes smaller than • 10ml for assessing patency. • Do not forcibly push against resistance[2]. • Limit contrast power injections to VAD and add-on devices with labelled indication for power injection[2] • No scissors!	• External fracture of a CVAD: Immediately kink / clamp line and tape securely using sterile tape or dressing[2] • Stop infusions and label 'Do Not Use' while awaiting referral for intervention[2]. • Recognise signs and symptoms of "pinch off" syndrome in patients with subclavian veins.[2pS157] • If Embolism suspected, treat as medical emergency, place patient on left side in Trendelenburg position (unless contraindicated (i.e., cranial pressure, eye surgery, cardiac and respiratory disease) and apply pressure to limb or consider applying a tourniquet above the site[2]. • Internal fracture will require referral to surgery or interventional radiology[2]. • Keep patient calm and stay with patient until help arrives. • Document as per Trust policy for patient safety incident.

Medical Adhesive Related Skin Injury: (MARSI)

Complication	Device	Signs and Symptoms	Cause	Prevention	Action
Medical Adhesive Related Skin Injury: (MARSI)	All Devices	• Blistering • Skin Excoriation • Itching • Redness • Blanching • Stripping • Skin tears – partial or full thickness	• Skin irritation due to inadequate time interval between skin cleansing with chlorhexidine & alcohol solution and application of the Transparent Semipermeable Membrane dressing[17]. • If the alcohol solution is not allowed to completely dry it increases the risk of causing a chemical skin burn underneath the TSM dressing[2] • Sensitivity to skin preparation, TSM dressing, adhesive glue on anchorage device etc[2,17]	• Identify patients at risk and take precautions with site care 9eg malnutrition, dehydration, elderly/neonates, dermatologic conditions, low/ high humidity, radiation therapy, medications i.e., chemotherapy, anti-inflammatories, including long term corticosteroid use, anticoagulants)[17] • Correct dressing technique: allowing a minimum 30 seconds for the Chlorhexidine Gluconate 2% in 70% alcohol to air dry[1]. • Risk assessment of each individual case to determine allergy status[2]	• Educate staff/caregivers on appropriate application of skin decontamination, atraumatic application/removal of dressings and to assess VAD sites for signs and symptoms of skin injury [2pS168,17] • Rule out infiltration/extravasation, thrombophlebitis and other skin conditions (e.g. eczema, impetigo)[17] • Apply protective barrier film at all dressing change, particularly for high risk patients[2]. • Alternative non-alcoholic cleansing agent (saline to clean followed by application of Povidone iodine spray)[2] • If skin flap present, approximate viable skin flap edges prior to dressing application[17] • Consider use of sterile, medical adhesive removal product to minimise discomfort and skin damage associated with removal of dressing [2,10,17] • Alternative dressings as per hospital policy. • Discuss with tissue viability. • If an occlusive dressing is used the dressing must be changed every 24 hours[1, 5] • Consider anti-inflammatory, anti-pruritic, antihistamine and/or analgesia; cool compress (applied on top of dressing) [1,17]

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