MUSKOKA ALGONQUIN HEALTHCARE

Muskoka Algonquin Healthcare

Peripheral Venous Access

Self-Learning Package

July 2019

Clinical Education

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Introduction

It is estimated that 80% of hospitalized patients will receive a form of intravenous therapy throughout their hospital stay. Peripheral Vascular Access Devices (PVADs), commonly referred to as Peripheral IV's (PIVs) are the most common Vascular Access Device used in hospital.

PVAD's are peripheral catheters inserted into an extremity (most commonly the upper extremity) with a catheter length of 7.5cm or less. Midline catheters are also considered peripheral catheters; however these are not inserted or commonly used at MAHC. Health care professionals are responsible to perform initial and ongoing assessments to determine the infusion needs of the patient and to ensure appropriate access is initiated, maintained and discontinued when necessary.

Objectives

Objectives

This package is designed to assist healthcare professionals to initiate and care for a patient with a PVAD. Nurses "are responsible to ensure that they have the knowledge, skill and judgment necessary to provide safe and effective infusion therapy" (RNAO, 2008). Upon completion of this package, learners will:

- Understand the indications and contraindications for intravenous therapy
- Demonstrate the ability to select an appropriate site and catheter for PVAD insertion
- Demonstrate the appropriate patient preparation for PVAD insertion, including patient teaching
- Demonstrate the procedure for insertion of a Nexiva Closed IV Catheter System
- Demonstrate a comprehensive site assessment of a PVAD
- Demonstrate appropriate locking and flushing technique of a PVAD
- Possess the knowledge of the required criteria to complete documentation of the insertion, assessment and maintenance of a PVAD
- Recognize signs and symptoms of complications associated with PVAD therapy, as well as interventions to initiate in these circumstances
- Explain the indications and risks associated with IV direct administration
- Demonstrate safe IV direct administration skills

Certification Program

At MAHC, all Registered Nurses (RNs) and Registered Practical Nurses (RPNs) are to initiate PVADs in upper extremities for prescribed therapies in the adult population; excluding in the lower extremities (eg legs, feet). RNs in specialty areas (eg ED, ICU, Surgical Services, FCC) may start PVADs for the pediatric population if they have the knowledge, skill, judgement, and critical thinking abilities related to pediatric PVAD therapy.

Nurses must attend an in person learning session reviewing indications and insertion of PVADs. This session will include an opportunity for insertion practice on a practice arm. Nurses will complete this self-learning package and obtain a minimum grade of 80% on the LMS module: *Peripheral IV: Quiz.* Following this learning, nurses must have a minimum of 9 successful PVAD insertions under direct supervision of a nurse who has successfully completed this process and provide documentation to the Clinical Nurse Educator.

Healthcare Providers are encouraged to review this package intermittently and attend in services reviewing materials related to PVAD use intermittently.

Rationale for PVADs

PVADs are inserted to provide access to the vascular circulation system. This may be required when patient care needs included:

- Maintaining or correcting fluid and electrolyte balances
- Administering medication
- Administration of blood and blood components
- Maintain or correct a patients nutritional state
- Administer anesthetic agents or diagnostic test dyes

A physician order or medical directive is required to initiate PVADs and associated therapies. For infusions, the order must include the

- Solution type
- Volume
- Rate
- Medication must include dosage and route

Verbal patient consent is also required to insert a PVAD. The procedure must be explained in terms a patient will understand.

Emergency Situations

In emergency situations, it is within the RN scope to insert a PVAD and initiate a normal saline infusion ONLY when delaying treatment would cause harm to the patient.

"Venipuncture to establish peripheral intravenous access and maintain patency using a solution of normal saline (0.9%) when the patient requires medical attention and delaying venipuncture is likely to be harmful to the patient" (CNO, 2009).

Common IV Solutions

Isotonic

Isotonic solutions have a concentration of dissolved particles equal to that of intracellular fluid. When they are administered intravenously, cells will neither swell nor shrink as a result of fluid shifts.

Hypertonic

Hypertonic solutions have a concentration of dissolved particles greater than that of intracellular fluid, causing fluid to shift out of the cell and into the extracellular (vascular) space. The cell looses fluid and will shrink. Monitor patients closely for fluid overload, as fluid is drawn away from the cells and into the vascular space.

Hypotonic

Hypotonic solutions have a concentration of dissolved particles less than that of intracellular fluid, causing fluid to shift out of the extracellular (vascular) space and into the cell. The cell will absorb fluid and swell. Monitor patients for vascular collapse, as fluid shift away from the vascular space and into the cell.

IV Solution	Type Of Solution	Common Uses and Considerations
Normal Saline 0.9% (NS)	Isotonic	• Fluid resuscitation replace extra cellular fluid losses • Only fluid to be administered with blood products • Commonly used to mix iv medication • Does not provide free water, calories or electrolytes other than chloride and sodium • Monitor for fluid overload
Normal Saline 0.45% (Half NS)	Hypotonic	• Lower concentration of solutes than plasma • For patients who are hypernatremia • Monitor patient closely as too much of this solution can cause hypotension, intravascular volume depletion and cellular edema
Lactated Ringer's (LR)	Isotonic	• Fluid resuscitation to replace extra cellular fluid losses • Similar in composition to plasma except that it has excel chloride, no magnesium and no bicarbonate • Reduces the amount of chloride, decreasing the likelihood of hyperchlorinemia • Lactate converts to bicarbonate, buffering metabolic acidosisproviding good liver and kidney perfusion • Does not provide free water or calories

		• Monitor patient for signs and symptoms of fluid overload
Dextrose 5% in Water (D5W)	Isotonic	• Contains no electrolytes • If given for a long time, may result in low serum electrolytes, water intoxication • Provides a source of calories • Used short term in patients with hypernatremia • Monitor blood glucose and serum electrolytes
3.3% Dextrose- 0.3% NS (2/3 & 1/3)	Isotonic	• Maintenance of normal fluid volume • Provides water and electrolytes • Small amount of kilojoules • Distributes evenly to all fluid compartments faster than 0.9%NS

Catheter and Site Selection

Selecting the Catheter

PVADs are sized according to length and gauge. Gauge of the catheter refers to the outside diameter of the catheter. The larger the gauge, the smaller the size of the catheter lumen.

Select the shortest catheter with the smallest gauge suitable for the type and duration of infusion.

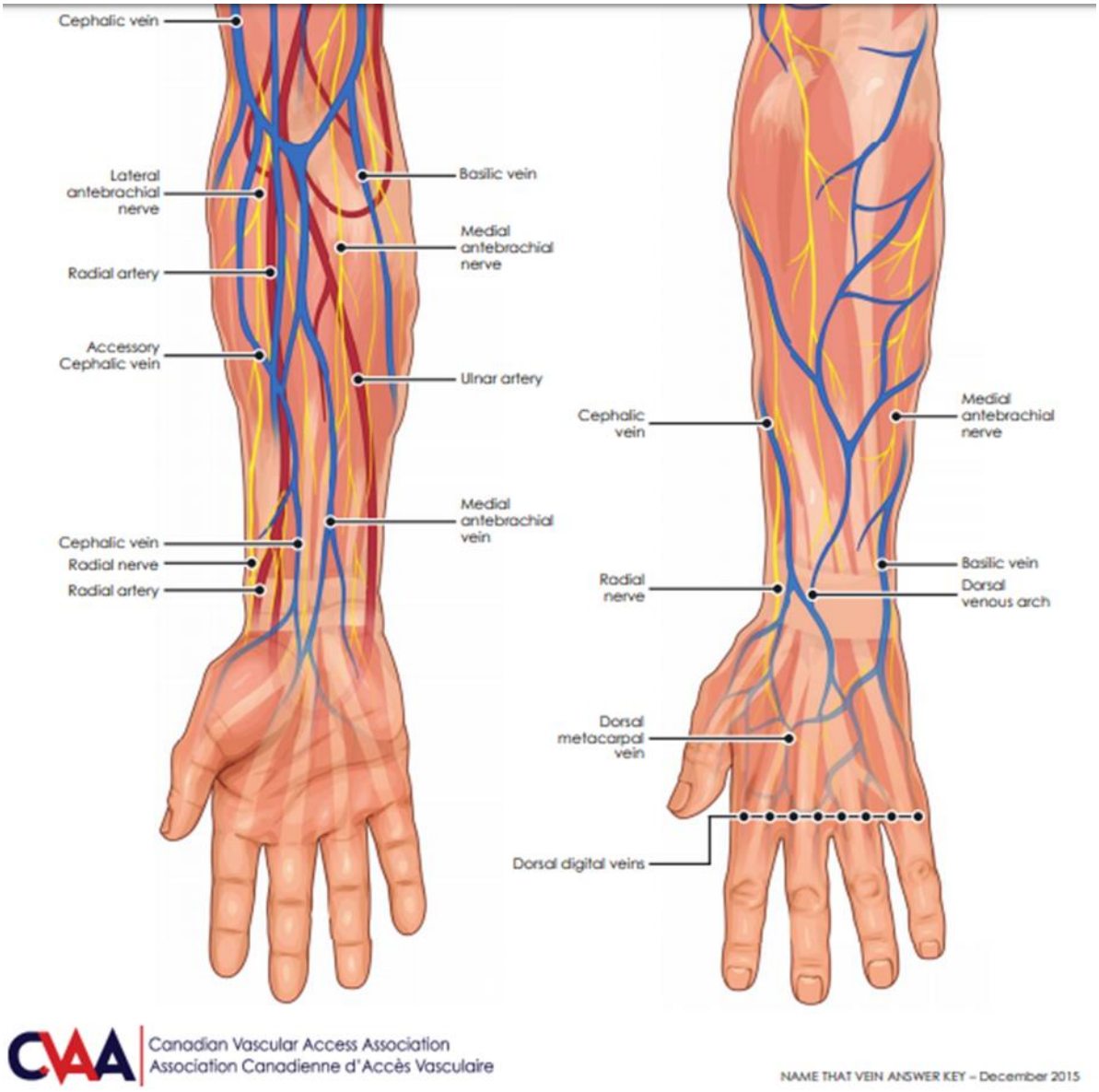
Catheter Gauge Size	Use this Size Gauge For
14	Life threatening situations
16-18	Trauma Surgery Blood transfusions Infusion of large volumes of fluid
20	Most adult needs (general infusions, intermittent infusions, blood transfusion)
22	Most adult needs (general infusions, intermittent infusion, blood transfusions)
24-26	General infusions Children, neonates and elderly Intermittent infusions Slow infusion rates

Selecting the Site

PVADs are inserted in the veins of the vascular system. It is important to ensure a vein is cannulated and not an artery or damage to a nerve, tendon or ligament. When palpating possible insertion sites, note these differences:

Veins	Arteries
Usually superficial and palpable	Usually deep
No palpable pulsation	Pulsation palpable
Soft and 'bounce back'	Tough
Dark blood with slow return when cannulated	Bright red blood with quick return that pulsates
Valves present	No valves
Collapse	Do not collapse

Vessels of the Upper Extremities:



To select a vessel, first consider the reasons for infusion and the patients comfort. Ask if they are right or left handed and avoid their dominant arm if possible. Consider the purpose for infusion, large catheters, large fluid volumes or blood products will require larger vessels. Many factors will guide the selection of a vessel for cannulation:

Consideration	Rationale
Choose most distal site on vein	Allows preservation of future cannulation sites
Avoid sites below previous infiltration or phlebitis	May interfere with flow rate May cause vein to rupture
Avoid areas of skin disease, edema, skin breakdown or open wound	Bacteria may be introduced, edema may cause catheter instability
Avoid thrombosed or bruised areas	May interfere with flow rate Insertion may be difficult and more painful
Avoid the arm on the side affected by patients with a history of stroke or surgical procedure (mastectomy, dialysis access)	
Avoid inner aspect of the wrist	Painful Fragile veins Arteries and nerves are close to the surface in this area
Avoid areas of flexion	Excessive movement may cause irritation Interference with flow rate Increased risk of thrombosis *Not appropriate for long term therapies*
Avoid veins with short straight segments, that have prominent valves or bifurcations	May be unable to thread catheter May damage vein

CVAA Online Learning Resources 2015 – Module 2

PERIPHERAL INTRAVENOUS (PIV) CATHETER **POSTER:** SITE SELECTION

GO

FIRST CHOICE (OPTIMAL):

- Dorsal forearm
- Ventral forearm
- Minimum 2 fingers' width from the wrist
- Assess distal sites first

NOTE: Larger veins in the forearm are preferred for infusions that need to be given rapidly. The bones of the ulna and radius act as natural splints at these sites and permit the patient greater freedom of arm movement and ability to participate in activities of daily living (ADLs).

CAUTION

SECOND CHOICE:

- Dorsal portion of hand, avoiding the thumb

THIRD CHOICE:

- Antecubital area – try for 2 fingers' width below or above

NOTE: The antecubital veins are a last choice as these sites are located at points of multiple flexion and extension which increases the risk of phlebitis.

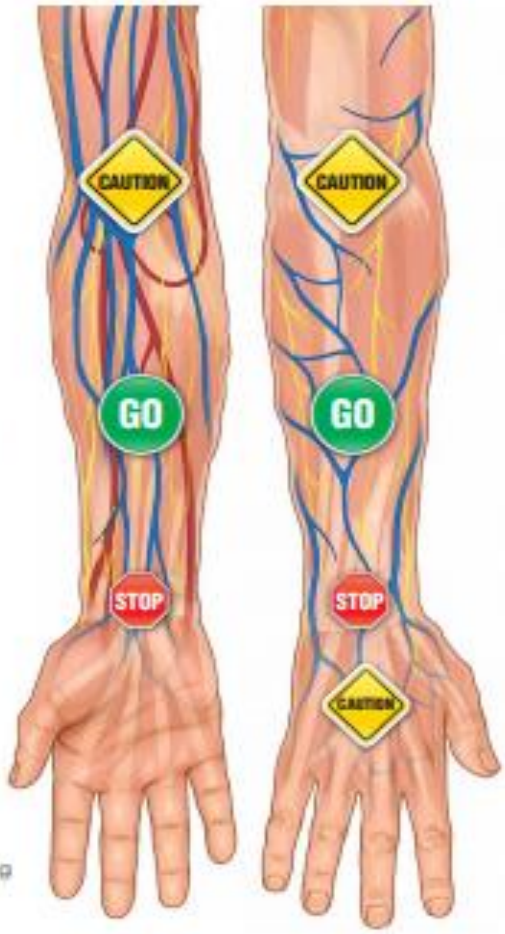
Infusion into these sites makes hourly assessments difficult as the proximal tissue is typically located under clothing, and not readily visible to the caregiver.

In the event that they are used, it is important to remove as soon as possible to prevent further damage to the vessel. Leaving these devices in can cause extreme discomfort to the patient and prevents usage of vessels further down on the arm.

STOP

AVOID USING THE FOLLOWING:

- Sclerotic or highly visible veins since they tend to roll
- Veins in an area of flexion
- Veins damaged by previous use (phlebitis or infiltration)
- Veins that are knotted or tortuous
- Areas of skin inflammation, disease or bruising
- An arm with an AV fistula
- Veins in an extremity that is edematous, compromised or injured



CVAA Canadian Vascular Access Association / Association Canadienne d'Accès Vasculaire

Insertion Technique

Prior to Insertion

- Review order for PVAD insertion and intravascular therapy
- Prior to initiation of PVAD determine patient allergies and sensitivities
- Employ methods to relax a patient: introduce yourself, use a calm confident approach, ensure the patient is in a comfortable position
- Identify the patient as per hospital policy
- Obtain verbal consent from patient

Patient Teaching

Prior to initiating a PVAD, all patients should be informed of:

- Type of device to be inserted
- Details of therapy
- How the venipuncture will occur
- That they may feel some discomfort such as burning or pinching at initiation, but once established, the IV should be painless

Preparing Materials

- Perform hand hygiene
- Gather supplies on a clean, clutter free bedside stand. You will need the solution to be infused, infusion set, IV tubing label, IV catheter, NS flush, chlorexhidine/alchohol prep, transparent dressing
- Ensure patient is in an “IV” gown (one with snaps at the shoulders)
- Check IV solution/ medication is correct, and is the appropriate colour, clarity, no leaks and expiration date
- Release the seal on the Nexiva IV catheter. Flush MaxZero needles connecter with saline and place in a sterile environment
- Remove protective sheath over IV tubing port on solution bag
- Raise the bed to a comfortable height and adjust lighting
- Place the patient in a comfortable position with the extremity toward you

Distend the Vein

- Apply a tourniquet (never leave on longer than 2 minutes)
- Open and close fist
- Lower arm below the heart
- Apply heat

Vein Selection

- Select veins on dorsal and ventral surfaces of upper extremities
- Use the most distal site available (avoid being distal to previous puncture sites or bruised areas)
- Avoid areas affected by pain, infection, wounds, CVA, paralysis or mastectomy
- Ensure vein is appropriate for VAD gauge and required therapy
- Select site that will not interfere with patient's ADLs
- Ensure vein has a resilient, soft, bouncy feeling when pressure is released
- Once vein is selected, remove tourniquet

Prepare the site

- Apply gloves if not already on
- Avoid shaving (use scissors or clippers if you need to remove hair). Shaving can cause micro cuts and increase the potential for infection
- Cleanse the area with chlorhexide/alcohol in a "hashtag" motion and friction (vertical x15 seconds, horizontal x15 seconds). Allow a 30second dry time
- Reapply tourniquet 4-6cm above target site
- Anchor vein below site by placing thumb over vein and gently stretching the skin against the direction of insertion distal to the site
- Warn the patient of a sharp, quick stick

Perform Venipuncture

Nexiva or Nexiva Diffusics (integrated) IV catheter closed system catheter insertion

- Once catheter is removed from the package ensure:
  - Vent plug connection is secure
  - In-line clamp is open
  - Flush Max Zero neutral displacement add-on device with sterile 0.9% NaCl pre-filled syringe. Consider leaving device attached to syringe to maintain sterility.
- Insert needle with bevel up at a 10-30 degree slightly distal to the actual venipuncture site in the direction of the vein
- Observe for blood return through flashback indicator indicating the bevel has entered the vein
- Once flashback is seen, lower and advance the entire device just slightly
- Continue to hold skin taut while stabilizing the needle and advance catheter off the needle with the grey tab to thread just the catheter into the vein until the hub is almost at the insertion site
- Stabilize the system. Using the white finger grips pull back to remove the needle
- Allow all tubing to fill with blood
- Remove tourniquet
- Apply clamp, remove plug at end of tubing and apply MaxZero needleless connector
- Remove clamp, then flush with a push pause technique
- **ANY PRACTITIONER WHO EXPERIENCES TWO UNSUCCESSFUL ATTEMPTS SHALL SEEK ASSISTANCE FROM ANOTHER PRACTITIONER TO INSERT THE PVAD**

Secure the catheter

- Place a transparent dressing (Tegaderm) over the catheter hub. Ensure the insertion site is always visible. The dressing should cover the area where the needle exited the device
- Label dressing with date of PVAD insertion and your initials
- Instruct patient how to move or turn without dislodging the device, how to mobilize with a pole or stand and to ask for assistance when bathing or changing a gown

POINTS TO PRACTICE

1a

PREPARATION:
- Secure vent plug.
- Clamp should not be engaged.
- Twist to remove needle cover.
- Holding as shown, pull back approximately 1.8" on finger grips *(fig. 1a)*.
- Push finger grips back to their original position so the stabilization platform and finger grips are snugly together *(fig. 1b)*.

1b

2

INSERTION AND FLASHBACK:
- Hold the system as shown and access the vessel *(fig. 2)*.
- Initial blood return is along the catheter, then up the extension tube. Look at catheter for initial blood return.
- Lower and advance the entire catheter and needle unit slightly to ensure the catheter tip is within the vessel.

3

ADVANCEMENT:
- Place pad of index finger behind the push-tab and push the catheter off the needle into the vessel *(fig. 3)*.

TIP: *Do not pull back on the needle during advancement.*

4

NEEDLE REMOVAL:
- Stabilize the catheter system and pull back on the finger grips until the push-tab component releases from the stabilization platform *(fig. 4)*.
- Discard the shielded needle into a puncture-resistant, leak-proof sharps container.

TIP: *Do not hold onto the push-tab component of the device as this will prevent the release of the needle shield.*

catheter septum

5

STABILIZATION:
- Apply a transparent dressing to cover the septum, allowing maximum use of extension tubing *(fig. 5)*.

1 2

6

PREPARATION FOR USE:
- Engage the clamp.
- Remove the vent plug and attach administration tubing or access port *(fig. 6)*.
- Release the clamp to flush or infuse.
- Complete securement of extension tubing.

Consult product insert for complete instructions, warnings and cautions.

BD

BD Medical
9450 South State Street
Sandy, Utah 84070
1.888.237.2762
www.bd.com/Nexiva

Documentation

- Document the date and time of IV cannulation
- Type and size of IV cannula inserted
- Site of venipuncture
- Number of venipuncture attempts and by whom
- Type, amount and flow rate of IV solution commenced
- Patients tolerance to the procedure

Complications Associated with Insertion of a PVAD

Complication	Possible Cause	Nursing Intervention
Missing the Targeted Vein	Inadequate anchoring of vein	Re-anchor the vein and apply constant traction until the insertion is completed
	Flattening of the vein by excessive traction application	Lessen amount of traction when anchoring the vein
	Visual distortion/inappropriate positioning during cannulation	Position yourself to accurately visualize and access targeted vein
	Inaccurate approach to vein	Insert cannula directly on top of the vein
Hematoma at the Insertion Site	Increased angle of catheter to skin during insertion	Decrease the angle of catheter to skin upon approach to vein
	Failure to lower the angle after entering the vein (causing trauma/ puncture to the posterior vein wall)	Lower the angle of catheter to skin after entering the vein
	Excessive force/ roughness	Gently insert the catheter to avoid puncturing the posterior wall of the vein and gentle separation of cannula from needle to avoid trauma to the vein
	Fragile skin and veins	Select vein with good blood volume
	Catheter size too large	Select a smaller size catheter
Flashback is present, but the catheter is unable to be advanced and / or threaded in	Inappropriate catheter size (too large)	Select a smaller size catheter
	Catheter to skin angle is too great	Reposition catheter to a lower angle and attempt to advance the catheter
	Sclerosed vein	Remove the IV catheter and apply pressure
	Stylet pulled back during	Stylet should be held

	insertion	stationary during insertion Do not attempt to reinsert/ advance as catheter can be sheared Remove total unit and attempt another venipuncture with a new catheter
	Catheter up against a closed valve	Remove the stylet If the system fills with blood, an experienced practitioner may then infuse a small amount of fluid to open the valve and allow the catheter to float into position

Care and Management

Patient Teaching

Once a PVAD is inserted, patients and family members should be taught to

- To limit motion at the PVAD site and avoid raising the extremity above the level of the heart (this may slow infusion rates)
- To keep the area dry and clean
- To keep the IV pump plugged in as often as possible and avoid touching the buttons/ tubing
- To call a care provider if they have pain, discomfort or swelling at the site or up the vein
- To call a care provider if they notice any blood or fluid leaking at the IV catheter site, a loose dressing or disconnected tubing
- To call a care provider when the IV pump alarms
- To call a care provider if the IV bag becomes empty

Assessment

During therapy, it is essential to perform frequent assessments of the PVAD, site and infusion to ensure no adverse events.

Daily, assess the response to and effectiveness of prescribed therapy, the integrity of the infusion system, signs and symptoms of complications and laboratory values.

Site Assessment

PVAD site must be assessed and documented at minimum every shift. The site must be assessed for signs of complications, and documentation must indicate the absence of redness, swelling, blanching, pain at the site or along the course of the vein or any rope/chord-like textures to the vein upon palpation. The condition of the dressing must be assessed and documented, as well as the ease of flushing.

Infusion Assessment

Infusions are to be assessed from bag to site at minimum every four hours while actively infusing to deter any adverse reactions. If a vesicant is continuously running check bag to site every 30 minutes.

Verify the Infusion: Ensure the correct IV infusion solution and rate are running

Inspect the Infusion: Inspect the infusion. Ensure infusion is not cloudy, hazy, discoloured or with visible particulate

Assess the line: Ensure Tubing is clear, free of kinks, no leaking

Assess the site: See above

*****Continued need for therapy should be reviewed at minimum daily*****

Tubing and Bag Changes

All IV tubing must be labelled with the date and time of initiation. Routinely change tubing to decrease the risk of contamination and infection

All IV starts require a new set of IV tubing
Continuous infusions: change tubing every 72 Hours
Intermittent infusions: change tubing every 24 Hours (ie: secondary medication administration sets)
Lipid administration tubing sets and filters are changed with each new bag or every 24 hours
Propofol infusion sets are changed every 6 to 12 hours
Bags of IV solution must be changed every 24 hours

Add-on devices (eg neutral displacement devices- MicroClave Clear, Max Zero) are to be changed with every catheter exchange and/or every 7 days, and if the device has evidence of have residual blood noted within it.

Do not set-up or use primary or secondary administration sets as "standby" or attached to a PVAD catheter which has been ordered as TKVO, as these are not indicated or required and are associated with increased risks of contamination and infection

Saline Lock

PVAD's may not always be connected to a continuous infusion. If not connected to a continuous infusion, the system is intermittently kept patent by the turbulent (push-pause technique) injection of 10mls Sodium Chloride 0.9% every 8 hours at designated times. If a saline lock is accessed between flushes for medication or fluid delivery, it is important to flush and lock the system adequately when reverting back to a saline lock.

To flush and lock

- Scrub the needleless connector with chlorhexidine for a minimum of 30 seconds. Allow a dry time of minimum 30 seconds
- Use 10mls prefilled Sodium Chloride 0.9% syringe to flush the system using a turbulent flush technique (push/ pause)
- Maintain a positive pressure while withdrawing the syringe to avoid blood flashback in the catheter which may clot the system.

****NOTE** At MAHC, the term TKVO (To Keep Vein Open) refers to a saline lock**

Documentation

PVAD site assessment and catheter functionality must be documented clearly every shift by stating the absence of erythema, edema & induration, and flushes with ease. “IV patent” is insufficient documentation.

If an infusion is running, site assessment and a ‘site to bag’ assessment are required every 4 hours.

Intravenous Flow Rate

At MAHC, all inpatients should have any IV fluids administered through an infusion pump and any IV medications not given IV direct MUST be infused through an infusion pump. The pump will control the rate of fluid/ drug administration. Smart library drug selections shall be used at all times to ensure patient safety.

Emergency and Surgical Services may hang general IV fluids by gravity.

Calculating Flow rate

- The IV flow rate is usually ordered in milliliters (mL) of fluid per hour. This order is then converted into the nuber of drops of IV fluid per minute to achieve the desired hourly infusion rate.
- To calculate the intravenous flow rate
    - Verify the physician order in mL/hr
    - Veryify the drop conversion factor for the administration set being used (on tubing package)
    - Convert the flow rate from ml/h into drops/minute

$$\frac{\textit{Total Volume Per Hour} \times \textit{Drop factor}}{\textit{Infusion Time}}$$

Example: $\frac{125\text{mL/h}}{60\text{ Minutes}} \times 10\text{ Drops/ Minute} = \frac{1250}{60} =$ 20.8 OR 21 drops/ minute

At the bedside, adjust the roller clamp as necessary to achieve the desired rate. To confirm the desired rate, count the number of drops for ONE FULL MINUTE

If using a rate regulator device instead of roller clamp, you must still verify the correct rate of fluid is being delivered by counting the appropriate number of drops/ minute

Direct IV/ IV PUSH

DIRECT IV: The administration of a dose of medication over at least 60 seconds through an established IV site directly into the systemic circulation (below the drip chamber).

IV PUSH: The rapid administration of medication through an established IV site directly into the systemic circulation.

IV direct and IV push may be used to:

- Deliver a fast acting medication quickly
- Inject a medication which cannot be diluted
- Limit fluid intake during medication administration
- Achieve maximal medication effects

Administration of medication through the port closest to the cannula results in a concentrated dose of medication entering directly into the patient's circulation system. Dangerous systemic effects can result from medication administration- vessels can be irritated by concentrated medications and medication complications can occur within seconds. With direct administration, no time is available to correct errors.

Considerations when giving IV Direct medications

- All medications given IV must be checked for appropriate administration method using the Ottawa Hospital Parenteral Drug Therapy Manual prior to preparation and administration.
- Do not use prefilled saline syringes to reconstitute or administer solution and/ or medication
- Do not dilute the solution and/ or medication, unless specifically stated by the manufacturer or pharmacist
- Follow medication with flush solution administered at the same rate as medication. Once dose is fully administered, follow with flushing and locking procedure or resume infusion

When administering medications IV direct/ IV push, the nurse must observe the patient closely for any adverse reactions. Stay with the patient and have them answer questions about how he/she feels.

Typical side effects of IV direct medications include:

Chills
Nausea
Localized pain
Burning and itching
<BP
Headache

Speed Shock

When administering medication via IV push, be alert for possible speed shock reaction. Speed Shock is the body's reaction to the injection of a foreign substance into the circulation. If the medication is injected too rapidly, can can cause toxic reactions (see complications graph). Manifestations can include syncope, shock and/ or cardiac arrest.

Discontinuing the PVAD

Discontinue a PVAD when clinically indicated or when venous access is discontinued by physician order.

- Verify the order to remove the IV catheter
- Clamp the IV tubing
- Glove with clean gloves
- Anchor the PVAD with one hand and remove the dressing with the other hand
- Place a 2x2 gauze over the insertion site and remove the catheter in a steady pulling motion
- Apply pressure over the site until bleeding stops
- Apply adhesive strip to removal site
- Examine PVAD device to ensure all components are intact
- Document the time of removal, site condition and amount of IV IV solution infused

Complications

Although PVADs are common in hospital, they must still be recognized as an invasive intervention with associated risks and complications. Proper assessment, management and care will mitigate the severity of any potential complications.

Complication	Signs & Symptoms	Possible Causes	Care Interventions	Prevention
Phlebitis	Tenderness at site Erythema at site and along vessel Induration Elevated temperature	Poor blood flow around device Friction due to cannula moving within vessel Thrombophlebitis at cannula tip Altered solution or drug pH	Remove PVAD Apply warm compress	Restart using larger vein if related to altered pH, or smaller cannula gauge if related to poor blood flow around cannula Using a filter Tape device securely to prevent excess cannula movement
Infiltration *An accumulation of fluid in the tissues* (See chart below for grading scale)	Edema at and above site, may extend along limb Discomfort, burning, pain or painless at site Decreased skin temperature around site, blanching at site Absence of backflow of blood	PVAD dislodgement from vessel or perforated vessel Infiltration of infusion solution and/or medication	Stop infusion Apply warm compress Elevate limb Assess for circulation Restart infusion above infiltration site or in another limb ** if medication infiltrates watch for tissue damage, sloughing or necrosis. If a vesicant solution is administered into the tissues this is an extravasation	Assess IV site frequently (minimum q 1 hr when infusing) Ensure site remains visible (transparent dressing)

Catheter Dislodgement	Loose tape and/or dressing Cannula visible outside of vessel Solution infiltrating	Loose tape and/or dressing Tubing snagged in bed linens, frame, side rails Removed by patient	Remove cannula if infiltration has occurred May retape without advancing cannula if no infiltration	Tape device securely Assess site frequently
Occlusion	Flow rate unchanged when solution raised Backflow of blood on tubing Discomfort at site	Flow interrupted Saline lock no flushed Line clamped too long	Attempt to flush, only until resistance met Replace PVAD	Maintain flow rate Flush immediately following intermittent infusions
Hematoma	Tenderness, bruising at site Inability to advance or flush	Vessel punctured through during insertion Blood leakage due to displacement of needle Inadequate pressure when cannula removed	Remove device Apply pressure to site Warm compress Assess for continued bleeding	Choose a vein to accommodate the cannula gauge and size Release tourniquet once insertion of cannula is successful
Severed Catheter	Leakage from cannula	Cannula sliced due to reinsertion of needle into cannula during insertion Cut by scissors	If visible, remove pieces If not able to visualize, notify doctor and radiology Place tourniquet above site to prevent progression of pieces through blood stream	Never reinsert the needles once withdrawn from cannula Never use scissors near cannulation site
Venous spasm	Pain along vessel Blanching at site Sluggish flow	Severe vessel irritation due to irritating solutions Administration of cold fluids	Apply warm compress Decrease flow rate	Use blood warmer

		Rapid flow rate		
Thrombosis	Pain, erythema, edema at site Sluggish or no flow rate	Injury to endothelial cells due to too large a cannula for vessel size	Remove cannula Restart on opposite limb Apply warm compress Assess for related infection	Ensure proper technique and cannula size selected
Nerve, tendon or ligament damage	Extreme pain Paresthesia Muscle contraction Delayted effects: paralysis, paresthesia, contractures/ deformity	Improper technique and/or site/ device selection Taping too tight Circumferential taping Improper splinting	Stop insertion Reassess for vein selection and location	Do not use wrist on palmar surface Never repeatedly penetrate tessures with device Avoid excess pressure and taping around a limb
Vasovagal reaction	Sudden collapse of vein during venipuncture Sudden pallor, diaphoresis, faintness/ lightheadedness, dizziness, nausea Decreased pulse and blood pressure	Anxiety and or pain may active Cranial Nerve 10 (vagus) and the parasympathetic nervous system	Lower head of bed Instruct patient to take deep breaths Assess vitals	Patient teaching prior to procedure Use of topical anesthetic if required
Air Embolism	Respiratory distress Weak pulse Unequal breath sounds Increased central venous pressure or neck vein engorgement	Emptied solution bag or air left in line during change Line not primed prior to infusion	Discontinue infusion Maintain patent airway Place patient on Left side in trendelenberg position (allows air to enter right atrium and	Prime tubing and all added adapters Use air detection device (such as a smart IV pump) Secure all connections with leur lock devices

	Decreased blood pressure Decreasing level of consciousness		disperse through pulmonary artery) Notify doctor	
Circulatory overload	Headache Flushing Cough Rapid pulse Syncope Dyspnea Cyanosis Neck vein distention Hypertension Pulmonary edema	Flow rate too rapid Roller clamp too loose on gravity tubing Renal impairment Miscalculation of fluid requirements	Raise head of bed Maintain patent airway, oxygen PRN Notify doctor	Monitor and assess need for flow rates hourly Use smaller volume IV solution bags for those at risk Use IV pump Keep accurate in and out records
Infection, mild to septicemia	Redness, pain, heat and swelling at site Flushed Fever Sudden change in pulse Backache Hypotension Nausea	Failure to remain sterile during insertion or site/equipment care Severe phlebitis Inadequate taping or dressing application Weakened immune system Prolonged indwelling of cannula	Notify doctor Culture site and device Monitor vitals	No touch or sterile technique for insertion Use transparent dressing to observe site Check expiration dates on all solutions, medications and tubing Use aseptic technique when handling equipment and solutions
Speed Shock	Flushed face Headache	Medication / fluid administered over too short a timeframe	Discontinue Drug infusion Lock primary line	Monitor patient closely when using IV Direct

	Tightness in chest Dizziness Hypotension Irregular pulse rate Syncope Shock Cardiac arrest		Notify MD	Administer drugs at prescribed rate Monitor rate frequently if gravity flow

Clinical Manifestations	**INFILTRATION SCALE**				
GRADE:	**0**	**1**	**2**	**3**	**4**
Edema	No	0 to 2.5 cm (1")	2.5 to 15 cm (1 to 6")	over 15 cm (over 6")	over 15 cm (over 6")
Cool to Touch	No	Yes	Yes	Yes	Yes
Disrupted Sensation (eg pain, tingling or burning)	No	Possible	Possible	Mid-Moderate	Moderate-Severe
Discoloration	No	Possible	Possible	Possible	Yes
Extravasation (typically due to a vesicant solution or medication)	No	No	No	No	Yes

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