

Vascular Access Devices

Use, Care & Maintenance



**Angela Allen
RN, CRNI**

Email:
aallen6666@comcast.net

Types of VAD

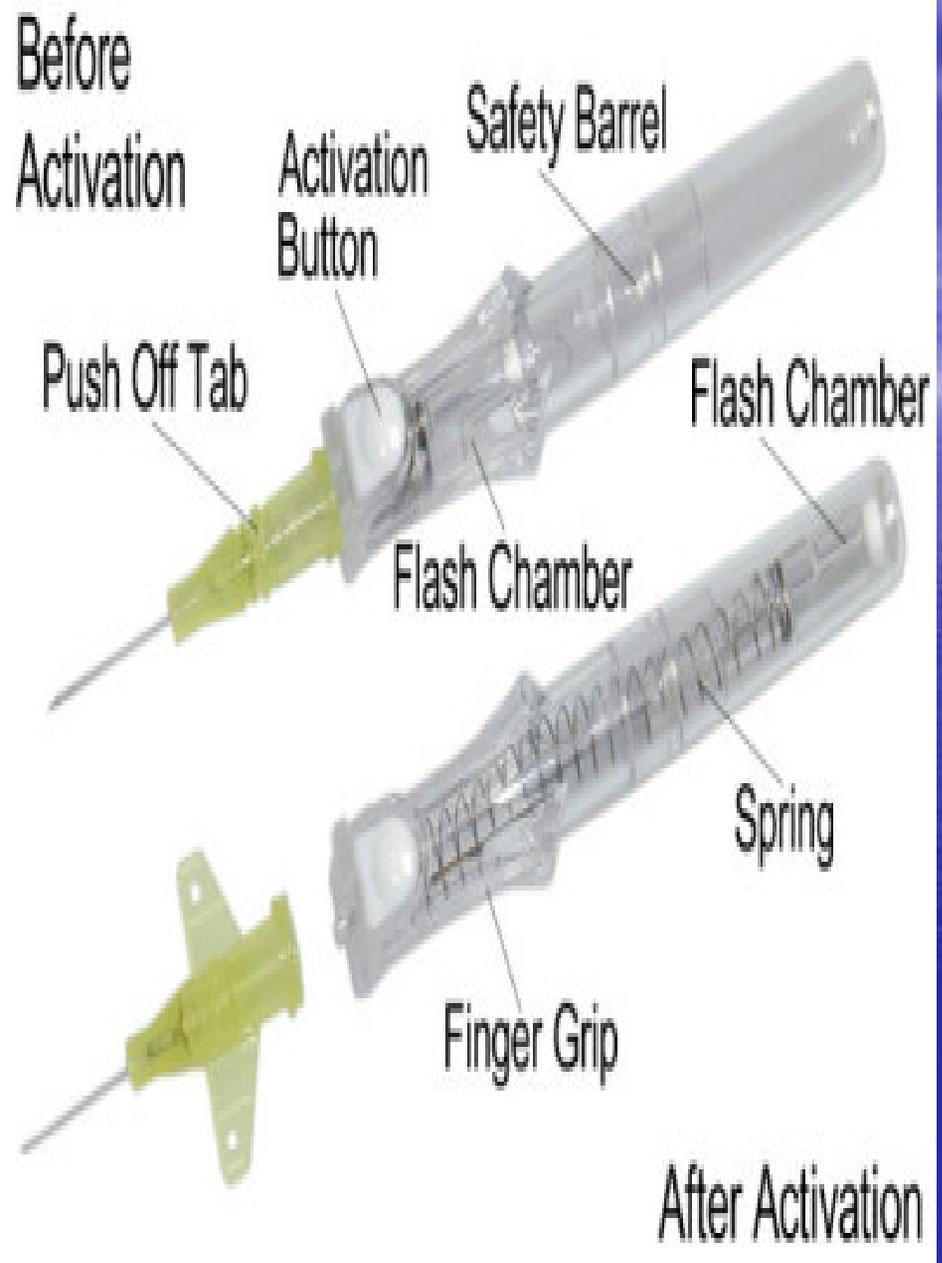
- Central Vascular Access
 - Tip is in SVC
- Peripheral Vascular Access
 - Tip is NOT in SVC

Peripheral IV Access

- Peripheral IV Access
 - Intended for days to weeks
 - Length 1" – 8"
 - Size 14 – 27 gauge or 3Fr – 4 Fr (midline)
 - Coated with anticoagulant, antimicrobial materials
 - Single to multiple lumens

Peripheral IV Access

- Peripheral IV Access
 - Site Selection
 - The Metacarpal, cephalic, basilic and median vein are recommended for insertion
 - From Distal of the extremity going upwards with future insertion
 - Area of flexion should be avoided
 - Area with phlebitis, infiltration, or skin bruise/tear should be avoided



Peripheral IV Access

- Advantages of Peripheral IV Access
 - Economical
 - Easy insertion and removal
 - Very low infection rate
 - Quick access

Peripheral IV Access

- Disadvantages of Peripheral IV Access
 - Requires routine site change resulting in repetitive venipunctures
 - Limited function – only for isotonic drugs and fluids (pH 7.35 – 7.45)
 - Increased risk of infiltration and extravasation
 - Increased patient discomfort

Central Venouse Access

Non-tunneled CVC's

- Short (about 20cm), single to multiple lumen catheters
- Directly inserted into subclavian internal jugular or femoral veins
- Tip located in SVC/IVC



Central Venouse Access

Non-Tunneled Central Catheter

–Advantages

- Quick access, mostly use under emergency situation
- Reliable, fully functioning central access
- Provide multiple lumens

Central Venouse Access

Non-Tunneled Central Catheter

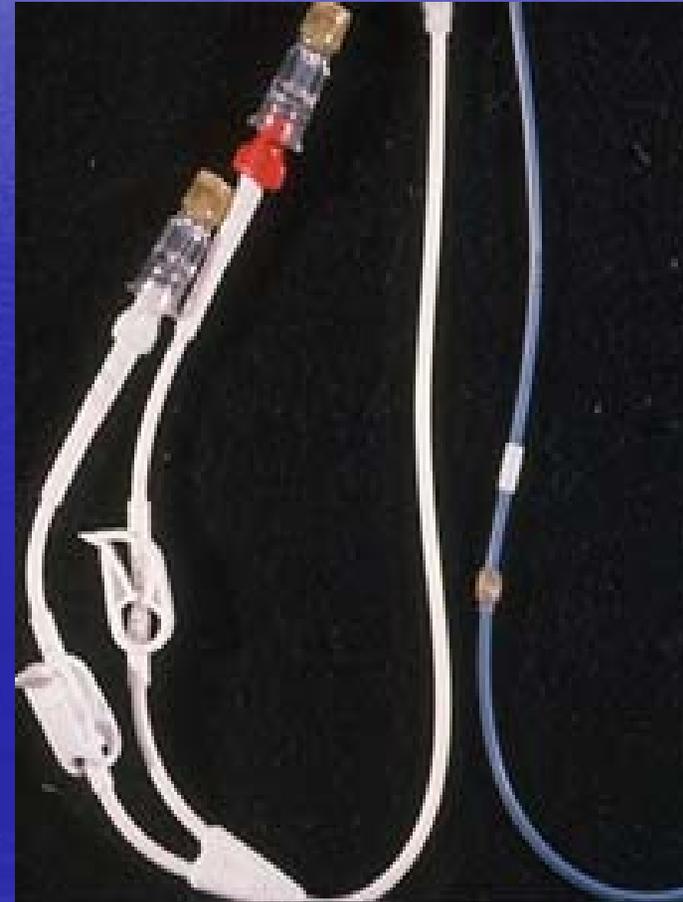
– Disadvantages

- High insertion complications
- Infection Rate 28 – 35%
- 90% of all CR-BSI
- Limited dwell time (7 days rec.)
- Patient Discomfort

Central Venouse Access

Tunneled Catheter

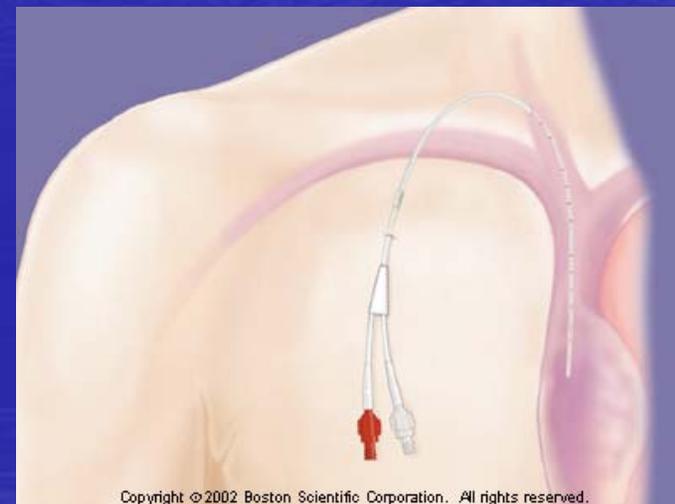
- With a Dacron cuff
- Used for patients who need prolonged IV therapy, such as post-transplant or cancer patient
- Surgical placement
- X-ray required



Central Venouse Access

Tunneled Central Catheter

- Advantages
 - Dacron cuff inhibits migration of organisms
 - Dacron cuff also prevent dislodgment
- Disadvantages:
 - High insertion complications
 - Infection rate higher
 - Costly insertion (M.D.)



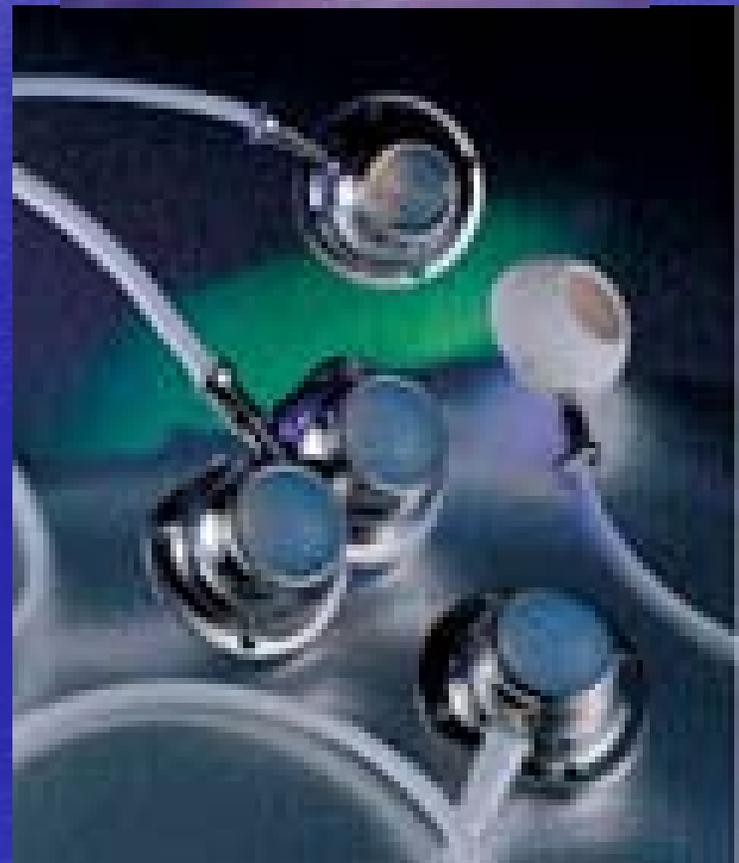
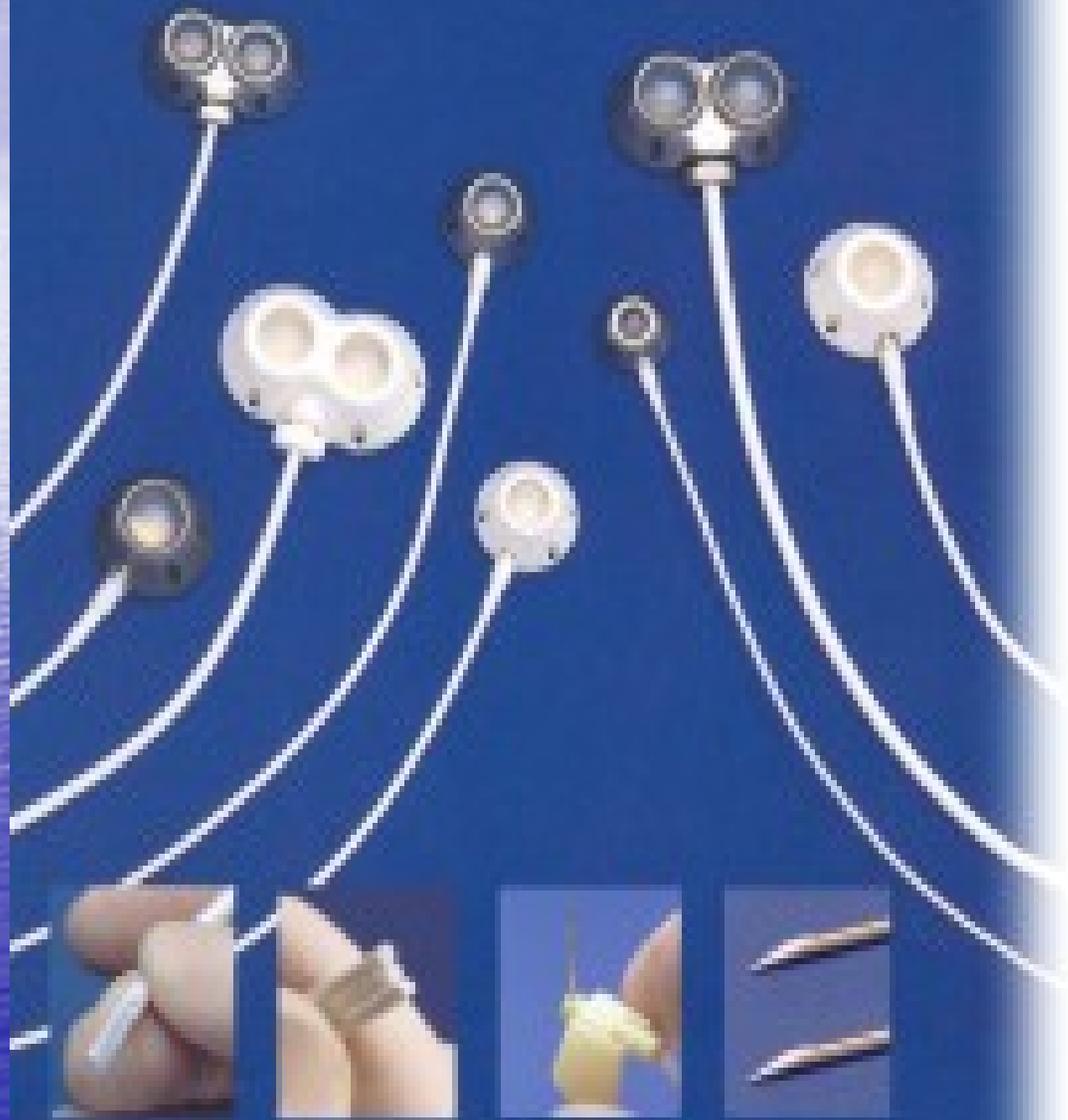
Copyright © 2002 Boston Scientific Corporation. All rights reserved.

Central Venouse Access

Implanted Venous Ports

- Surgically implanted
- Single and double, side accessed, dome port (access from any angle)
- Central and peripheral implants
- Accessed with Huber needle (90 angle, noncoring)
- Port height: 9.8 – 17 mm;
diameter: 24 – 50 mm.





Central Venouse Access

Implanted Venous Ports

- Advantages:
 - Body image intact
 - Lowest infection rate among all CVCs
 - Long term Access
 - Least impact on ADL

Central Venouse Access

Implanted Venous Ports

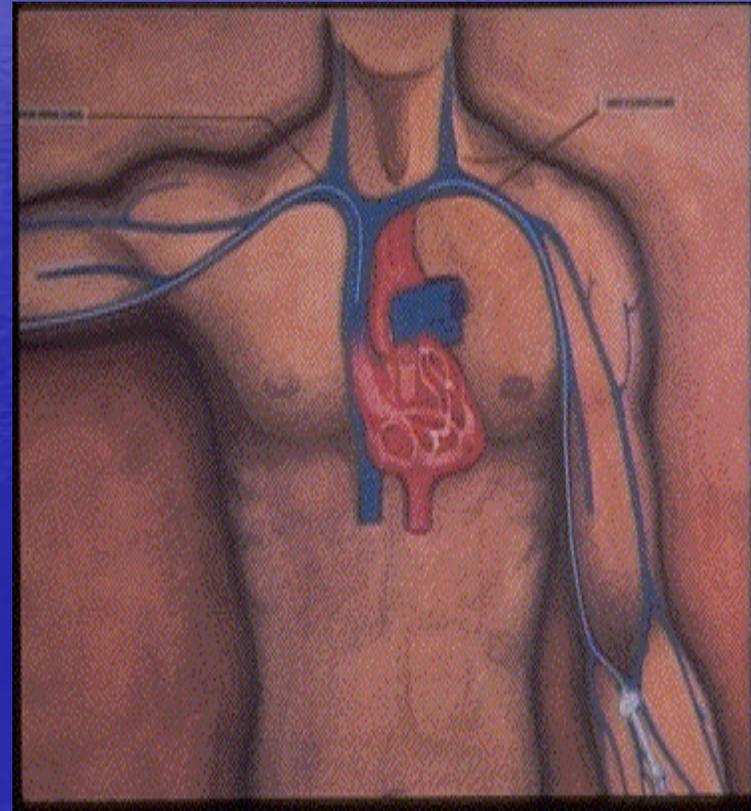
– Disadvantages:

- Needle access required
- Possible needle dislodgement and extravasation
- Highest cost among CVC's

Central Venouse Access

Peripherally Inserted Central Catheter (PICC)

- Single, double, triple lumen available
- Power PICC: 300 PSI limit
- Nurses who are equipped with Ultrasound have almost 100% success rate

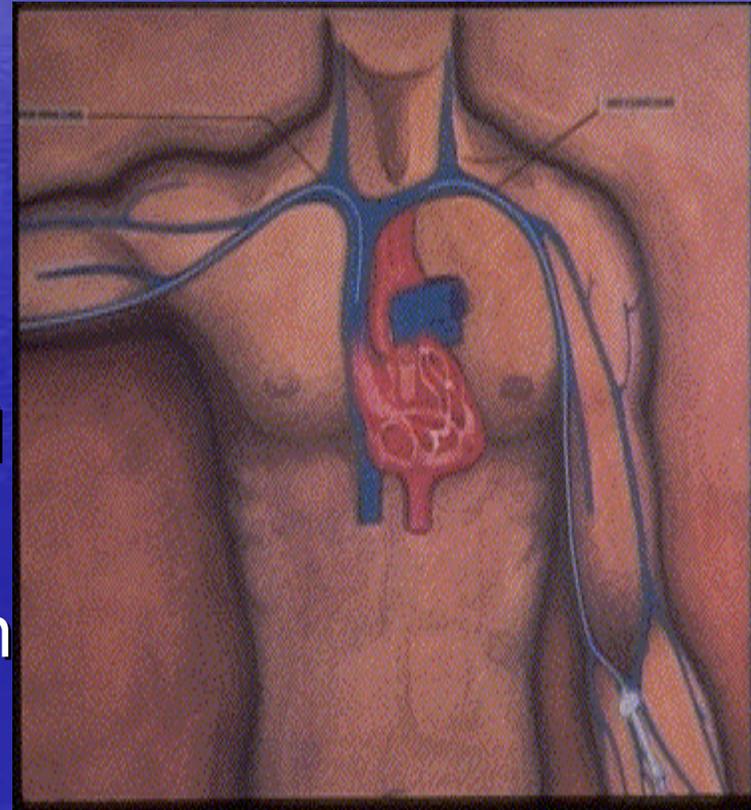


Central Venouse Access

Peripherally Inserted Central Catheter (PICC)

– Advantges

- Nurse performed bedside insertion
- Safe, reliable IV access
- Fully functioning as central lines
- Rare insertion complication
- Very low catheter-related infection rate



Central Arterial Catheters

- Pulmonary artery catheters
 - To monitor hemodynamics
 - Has the ability to determine cardiac output and mixed venous oxygenation
 - May have a port for pacing wires

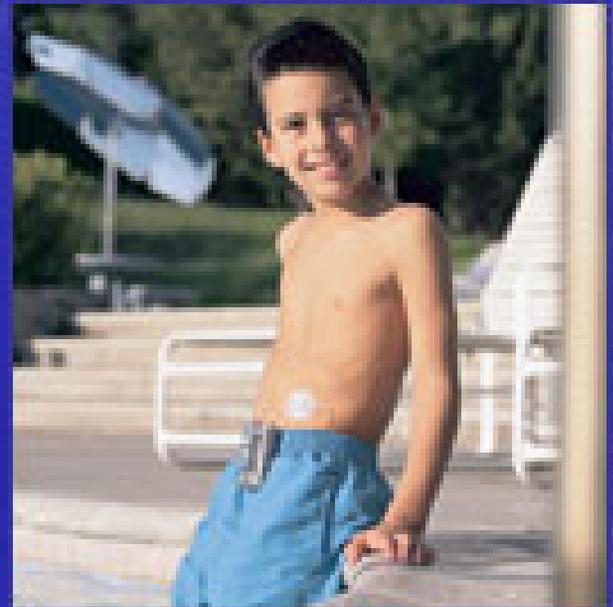


Peripheral Arterial Catheters

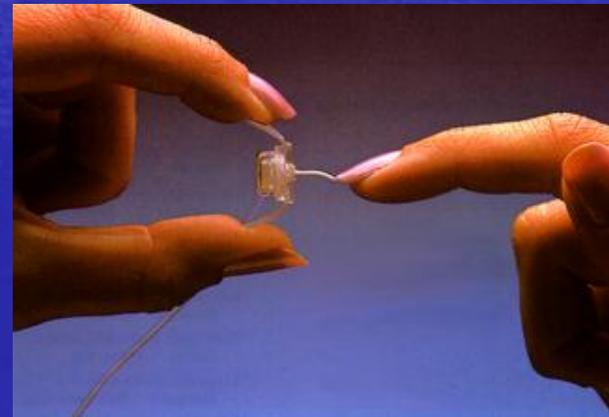
- Inserted into radial, brachial, or femoral arteries
- Monitor hemodynamic status of critically ill patients
- For pts who need frequent ABGs
- For pats who are on vasoactive drugs
- Administer local intra-arterial chemotherapy

Computerized Implanted infusion pump

- Pain management
- Diabetes
Management



Implanted Pumps



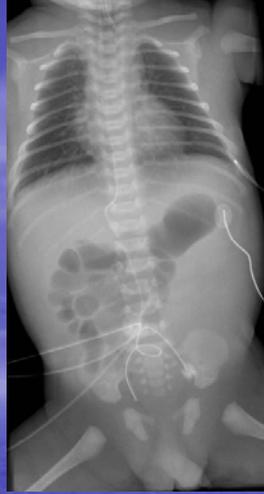
Sub-cutaneous Access

- SQ infusion sets (Sofset)
 - Diabetes management
 - Pain management
 - Easy access and removal
 - Ideal for home infusion

Epidural Catheters

- Inserted by Specially trained RNS
- Pain management with PCA Pump

Umbilical Catheters



- For newborn infant,
- Infants less than 1000g should have an umbilical venous catheter (UVC) inserted on day 1.
- An umbilical arterial catheter (UAC) may be indicated if the infant has significant respiratory disease (ventilated or >40% oxygen) or is likely to require significant blood sampling over the first few days of life
- Umbilical Arterial Line: tip should be in the descending aorta above the level of the diaphragm and below the left sub-clavian artery
- Umbilical Venous Line: tip should be @ inferior vena cava

Arterio-Venouse Fistulas and Hemodialysis Catheters

- Do NOT perform venipuncture or BP monitoring on the extremities containing an AV fistula
- Requires specially trained medical personnel to access/de-access and assess the integrity of device
- Should NOT be used for routine infusions or blood sample collection

Site selection



- Peripheral Lines

- Dorsal and ventral surfaces of the arms and hands for adults
- Obtain MD orders for lower extremity insertions
- Avoid hands and wrists if the line is for chemotherapy
- Avoid the extremities that has AV shunt, or has had major surgeries such as mastectomy

Site selection

- PICC & Midlines

- Cephalic, basilic and median cubital veins are the vein of choices for adults
- Femoral and scalp veins can be used for neonates
- Size in diameter: Basilic vein: 8 mm
Cephalic vein: 6 mm
- Alternative vein such as ovarian vein, lumbar vein can also be used

Potential Insertion Complications

<u><i>Antecubital Approach</i></u>	<u><i>Chest Approach</i></u>	<u><i>Either Approach</i></u>
<i>Thrombophlebitis</i>	<i>Pneumothorax</i>	<i>Posterior wall penetration</i>
<i>Hematoma</i>	<i>Hemothorax</i>	<i>Malposition of catheter tip</i>
<i>Tendon/nerve damage</i>	<i>Hydrothorax</i>	<i>Contamination/infection</i>
	<i>Chylothorax</i>	<i>Arterial puncture</i>
	<i>Brachial plexus</i>	<i>Thrombosis</i>
		<i>Air embolism</i>
		<i>Perforation right atrium</i>
		<i>Cardiac arrhythmia</i>
		<i>Catheter embolism</i>

Data Source: "Peripherally Inserted Central Catheters", M.A. Ryder. Nursing Clinics of North America, Vol.. 28, No. 4, December 1993: 937-70

Post Insertion Complications

- Infiltration/extravasation
- Phlebitis
- Catheter Occlusion
- Catheter damage
- Infection

Infiltration/Extravasation

- Infiltration is the inadvertent administration of a nonvasicant solution or medication into surrounding tissues
- Skin: edema, coolness, blanching
- Tenderness and/or discomfort



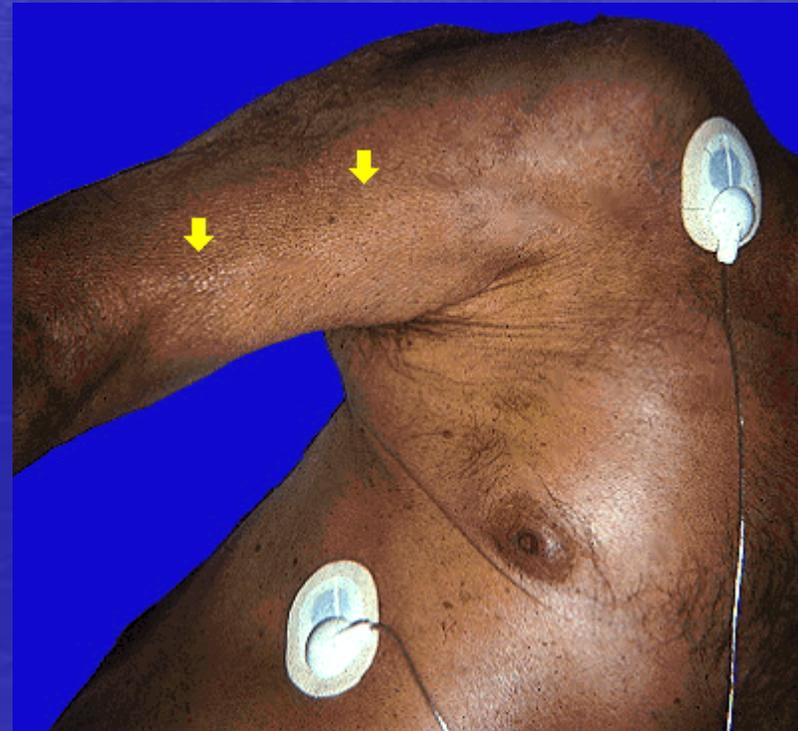
Infiltration/Extravasation

- Extravasation: inadvertent administration of a vesicant solution/medication into the surrounding tissues



Phlebitis

- Signs & Symptoms
 - Pain or tenderness
 - Erythema
 - Swelling
 - Venous cord
- Type
 - Chemical
 - Mechanical
 - Bacterial



Phlebitis

- Notify physician
- Begin treatment immediately
- Rest & elevate
- Low degree moist heat
- Mild exercise
- Continue until symptoms resolved

Catheter Occlusion

- Causes
 - Thrombotic
 - Thrombus
 - Fibrin sheath
 - Non-thrombotic
 - catheter mal-position
 - drug precipitate
 - lipids

Catheter Damage

- Prevention
 - Avoid the use of scissors or other sharp objects
 - Administer medications without force
 - Use 10cc syringes when administering medications

Infection & BSI

- Blood Quantitative Study
 - May be obtained to facilitate the diagnosis of a catheter-related infection without removing the catheter
 - Samples are drawn percutaneously and compared with blood drawn from the suspected device.
 - The concordant growth is 4:1 or greater (Catheter-drawn:percutaneous)

Site Care

- Cutaneous antiseptics and antimicrobial ointments
 - 70% Alcohol followed by 10% Povidone Iodine
 - 2% chlorhexidine
 - Tincture of iodine
 - Biopatch if indicated
 - Application of antimicrobial ointments to the catheter site remains controversial

Site Care

- CVCs, Midlines and Implanted Port
 - Transparent dressings: Change q 7days and PRN
 - Gauze dressing: q 48 hrs and PRN
 - Strict sterile procedure when change dressing
 - Assess for s/s of complications during the dressing change
 - Assess for patency with each dressing change

Catheter Replacement

- Peripheral Lines
 - CDC recommendation: Site change q 96 hrs and PRN in adults
 - For patients who have poor IV access, who have had mastectomy, and have AV fistula, obtain order form MD for “no routine site change”. Change dressing instead
 - NO IV should be left longer than 8 days
- CVCs including PICCs: No recommendation for dwelling time

Replacement of Intravenous Fluids and Administration Sets

- Infusion fluid bag change: Q 24 hrs
- Intravenous administration set replacement
 - Fluids & ABT: Q 96 hrs
 - TPN: Q 24 hr

In-line Filters

- Reduce the risk of infection from contaminated infusate or proximal contamination
- Reduce the risk of phlebitis in patients who require high doses of medication
- Remove particulate matter
- Filter endotoxin

*Non-lipid fluid: 0.2 Micron ,
Lipids: 1.2 Micron*

Patency maintenance

- Strictly adhere to flushing policy
 - Flushing according to your facility's P & P
 - Positive Flush
 - 20cc NS + Heparin for TPN pts
 - 20cc NS + Heparin after blood draw
 - Use Posi-Flow

Patency maintenance

- Catheter Occlusion Intervention & Prevention
 - Use sodium bicarbonate for drugs with high PH
 - Use 0.1 N hydrochloric acid for precipitated drugs with low ph
 - Use 70% ethyl alcohol to dissolve lipid aggregate

Patency maintenance

- Intervention & Prevention
 - Use TPA for blood clotting and fibrin sheath.
 - Injecting TPA routinely Q month for occlusion prevention has also been trailed and proven effective

Patency maintenance

- Catheter Occlusion
 - Intervention & Prevention: new development and research for occlusion prevention
 - Low dose TPA infusion into catheters to dissolve fibrin sheath
 - Intra-luminal brush to clear the occluded catheter

Procedure of PIV Insertion

SITE SELECTION

- Peripheral short catheter sites will be changed every 96 hours, or sooner if signs/symptoms of complications. MD order is needed to extend catheter dwell time.
- IV catheters inserted under emergency conditions should be replaced within 48hrs
- Placement assessment should be done to determine if a peripheral-short catheter is appropriate. Vein selection should be based on type of fluid, rate to be delivered and duration of therapy.

Procedure of PIV Insertion

- SITE SELECTION

- Use upper extremities for peripheral venous access. Veins which are appropriate for peripheral cannulation include but are not limited to the metacarpal, cephalic, basilic and median veins.
- Site selection should be initiated in the best distal vein of the upper extremity as subsequent cannulations will be proximal to the previous IV sites.
- Avoid areas of flexion unless properly immobilized, sclerotic veins and compromised extremities due to mastectomy, axillary node dissection, lymphedema, shunts and skin conditions.

Procedure of PIV Insertion

- SITE PREP

- Wash hands. Don gloves.
- If patient's skin is unusually dirty, soap and water cleaning will be done prior to antimicrobial solution.
- Clean intended insertion site with alcohol pad, followed by 1 chlorhexidine (ChloraPrep) applicator. Allow the ChloraPrep to dry x 30 seconds. OR
- Clean intended insertion site with alcohol pad, followed by 1 Tincture of Iodine (2%). Allow Tincture of Iodine to dry x 30 seconds. OR
- Clean intended insertion site with alcohol pads, followed by 1 Povidone-iodine (10%). Allow to dry x 2 minutes.

Procedure of PIV Insertion

- CANNULA PLACEMENT

- Use smallest gauge possible to deliver the therapy.
- Use a new sterile cannula for each IV start or attempt.
- The RN will verify appropriate placement and patency using a NS flush and instruct patient/caregiver in how to verify patency.
- Attach a short (4-14") minibore extension tubing with injection cap if needed.
- An RN will make no more than 3 attempts to successfully start an IV.

Procedure of PIV Insertion

- **ASSEMBLE SUPPLIES**
 - IV cannula (needle-safe)
 - Injection cap
 - Minibore extension tubing, if needed
 - 3-10ml syringe with 5 ml NS
 - Blunt syringe cannula, if needed
 - IV start kit, or gather the following:
 - Transparent dressing
 - Non-sterile gloves
 - ChloroPrep or Iodine prep
 - Alcohol pad
 - Gauze pad
 - Tourniquet
 - Tape
 - Label
 - Sharps Container

Procedure of PIV Insertion

- **PROCEDURE**

- Explain procedure to patient.
- Clean work area. Wash hands. Prepare supplies.
- Prime extension tubing with injection cap attached.
- Apply tourniquet and select vein. Release tourniquet.
- Clip hair if needed (shaving is not recommended).
- Clean site with alcohol pad x 30 seconds using outward spiral motion with friction. Allow to dry.
- Clean site with ChloroPrep, Tincture of Iodine 2%, or Povidone-iodine 10%. Allow to dry.
- Reapply tourniquet. Don gloves.

Procedure of PIV Insertion

- Perform venipuncture (Follow manufacturer's guidelines for cannula placement and activation of needle-safe devices).
 - Insertion of Insyte AutoGuard:
 - Prior to needle insertion, release catheter seal by rotating catheter hub 360°.
 - Access vein at low angle (15-30°).
 - Observe flashback. Lower catheter almost parallel to skin.
 - Advance entire unit 1/8". While maintaining skin traction, thread catheter into the vein.
 - Release tourniquet.

Procedure of PIV Insertion

- Occlude tip of cannula by pressing fingers of nondominant hand over approximate vein pathway to prevent retrograde bleeding.
- Remove needle device and discard in sharps container.
- Stabilize catheter hub. Depress white button on unit to activate needle withdrawal.
- Attach primed extension tubing with injection cap attached to catheter. Attach NS syringe, aspirate to verify placement, and flush with NS using stop/start method.
- Secure catheter site. Apply transparent dressing.

Procedure of PIV Insertion

- Secure tubing outside of dressing.
- Label site with date, time, needle gauge, and initials of nurse.
- Proceed with prescribed therapy as appropriate.
- Remove gloves. Discard used supplies.
- Wash hands.
- Documentation guidelines
 - Procedure performed
 - Number of attempts
 - Insertion site
 - Size of catheter inserted
 - Outcome/patient response
 - Dressing applied
 - Patient education



***Thank you very
much and have a
great Summer!***