THE TELEFLEX ACADEMY

Ultrasound PICC Insertion Workshop

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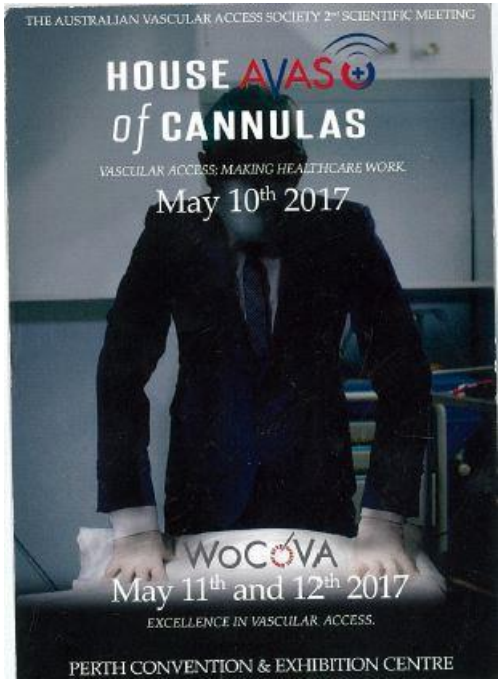
Teleflex®

Disclosures

- Joy Blacka is a full time employees of Teleflex Medical ANZ

Networking, Research & Learning

- **NZINS:** http://www.ivnnz.co.nz/
  http://www.ivnnz.co.nz/about-ivnnz-inc./Infusion-Standards-of-Practice
- **AVAS** www.avas.org.au/
- http://www.avatargroup.org.au/
- **CNSA** https://www.cnsa.org.au/
- **INS** www.ins1.org
- **AVA** http://www.avainfo.org/



PICC & Midline On Line Resources

Quick Start Guide to Education

Access has been provided to you by

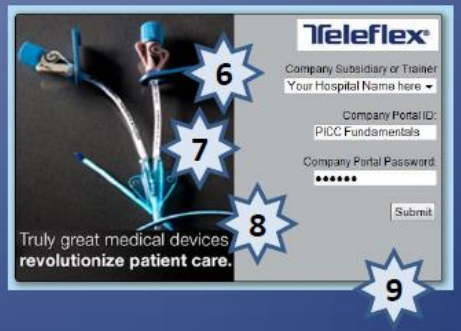
Teleflex®

You now have access to PICC Fundamentals, free **online education** (with CEs) sponsored by Teleflex Vascular Access Division. All education is available through a link with PICC Excellence, Inc, 24 hours a day/7 days a week from any internet access terminal.

Simply follow these instructions:

1. Go to www.piccexcellence.com
2. At the top of the home page, click **Log In or Log Out/Create New account**

3. Find **Create Personal or Site License Account** on the drop down menu and click on it.
4. Select Company/Organization
   Teleflex
5. Click: **Continue**
6. Choose Company Subsidiary (using drop down menu)
   Your Hospital Name
7. Enter Company Portal ID
   PICC Fundamentals
8. Enter Company Portal Password
   VAD101
9. Click **SUBMIT**



To save your work **always** click **SAVE & EXIT** when you walk away from the online class and the program will save your place.

FIRST TIME USERS:

Complete info under: **Create Your Site License Account**

- Remember your email _____
- Remember your password _____

Health Outcomes

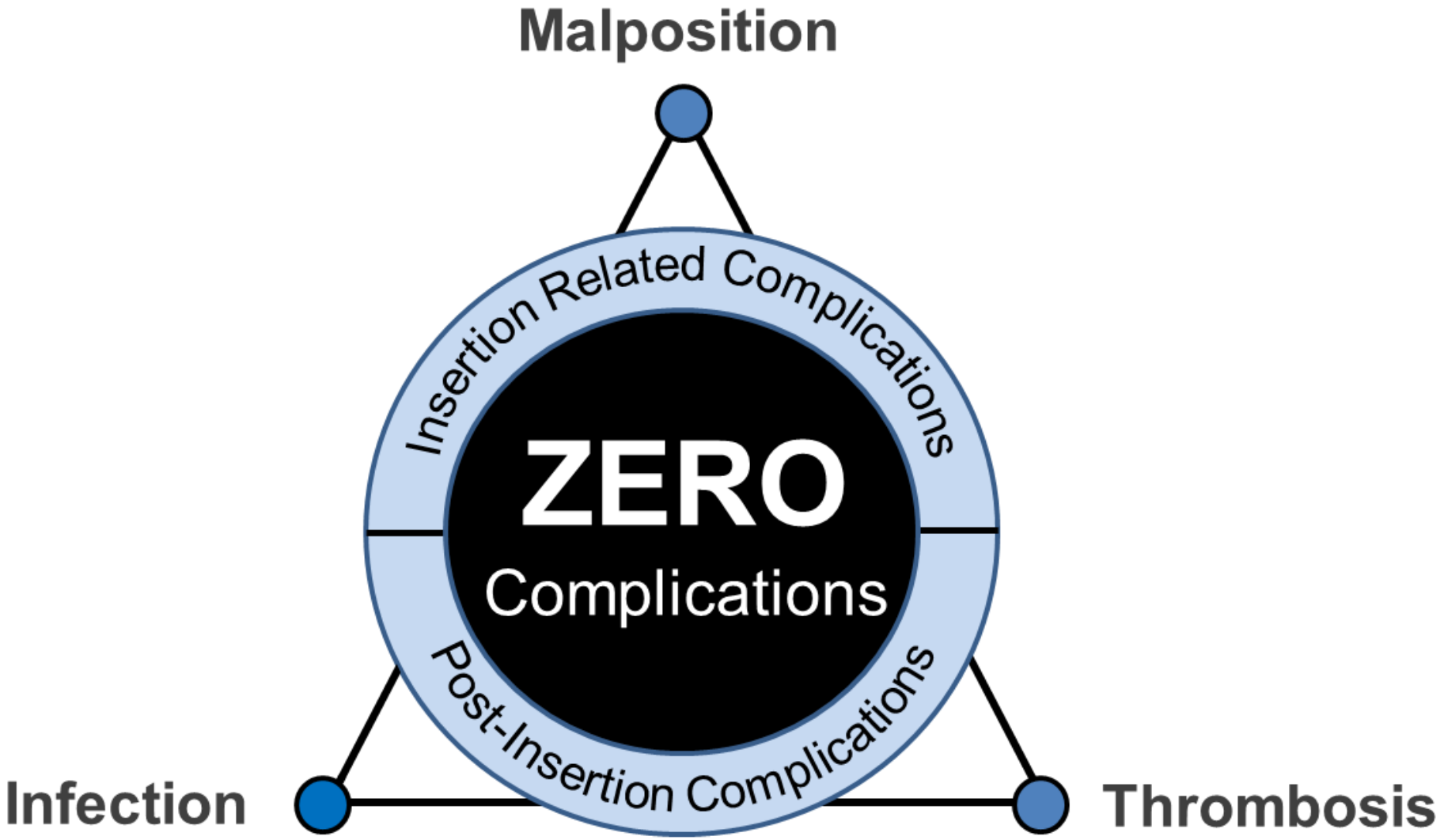
The effect of treatment & care, by health professionals, on patients

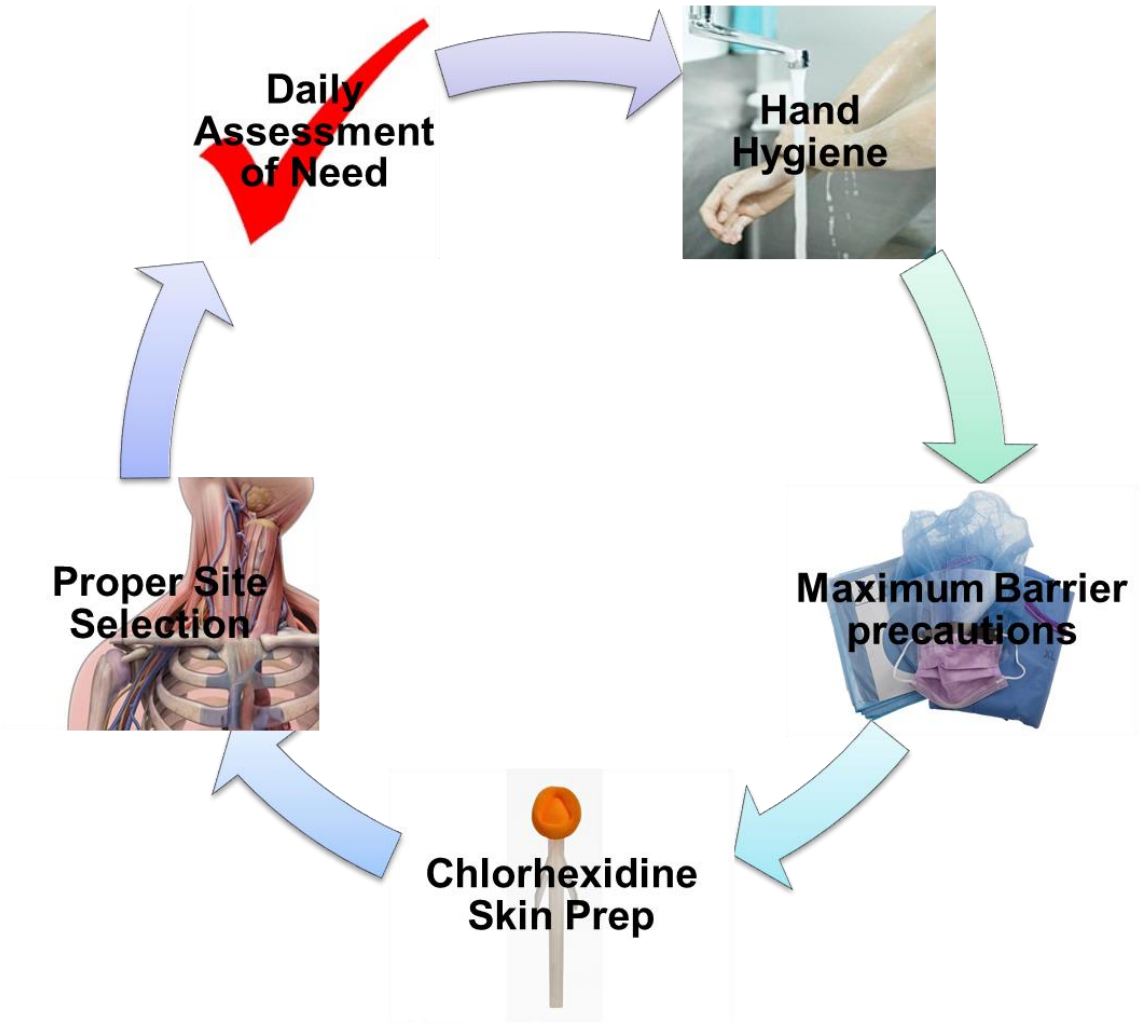
Vascular Access Outcomes

- Successfully complete infusion therapy
- Reduced VAD related complications
- Reduced number of venepunctures per patient
- Patient Satisfaction
- Reduce exposure to blood borne pathogens
- Reduce supply & labor related costs

CDC Guidelines 2011

- Select device based on intended purpose, duration of use, known infectious and non-infectious complications and experience of individual catheter operators . (Category 1B)
- Use a midline catheter or a PICC, instead of a short peripheral catheter, when the duration of IV therapy is likely to exceed six days . (Category 11)
- Educate health-care workers regarding indication for ivcs, proper procedures for the insertion & maintenance of ivcs (Category 1A)
- Assess knowledge of & adherence to guidelines periodically for all persons who insert & manage intravascular catheters (Category 1A)
- Designate only trained personnel who demonstrate competence for the insertion and maintenance of peripheral & central intravascular catheters (Category 1A)
- Use a sutureless securement device to reduce the risk of infection for intravascular catheters (Category 11)
- Use ultrasound guidance to place CVCS to reduce number of cannulation attempts and mechanical complications (Category 1B)

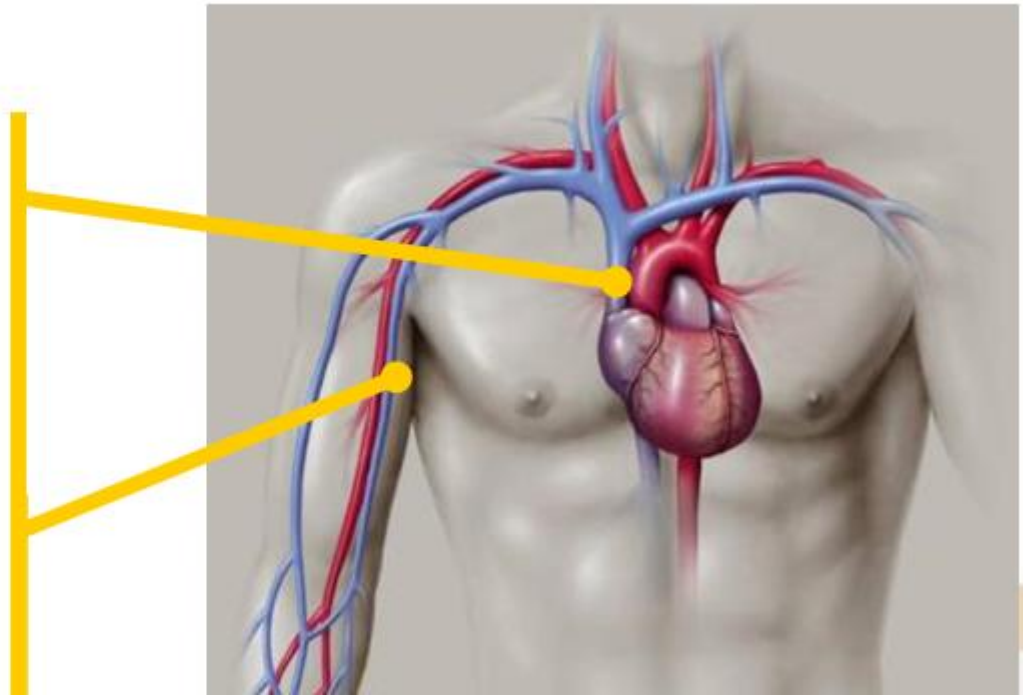

Malposition
Insertion Related Complications
ZERO
Complications
Post-Insertion Complications
Infection
Thrombosis


Daily Assessment of Need
Hand Hygiene
Maximum Barrier precautions
Chlorhexidine Skin Prep
Proper Site Selection

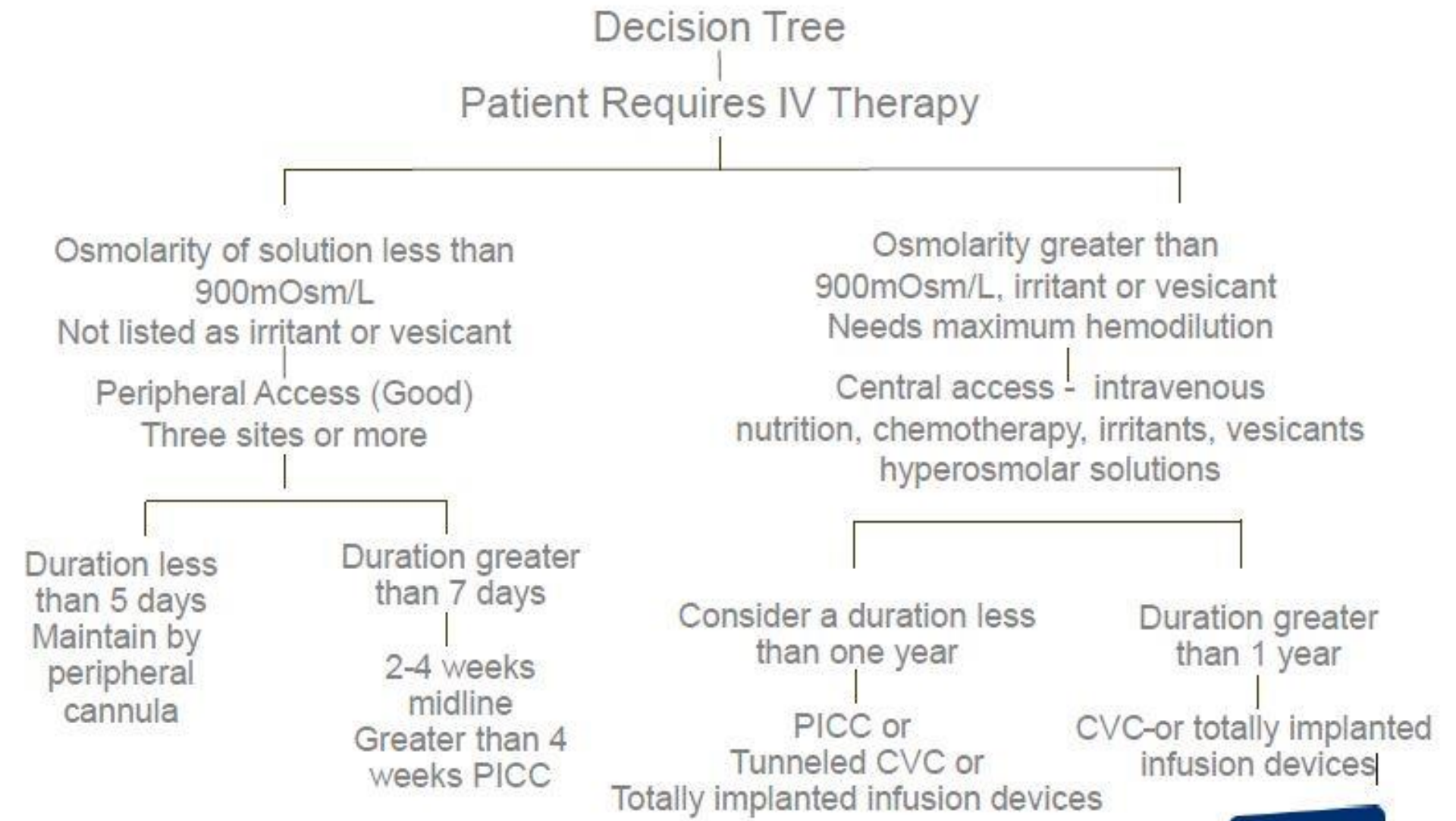
Tip Position

1. **PICC**

2. **Midlines / Peripheral Cannulas**



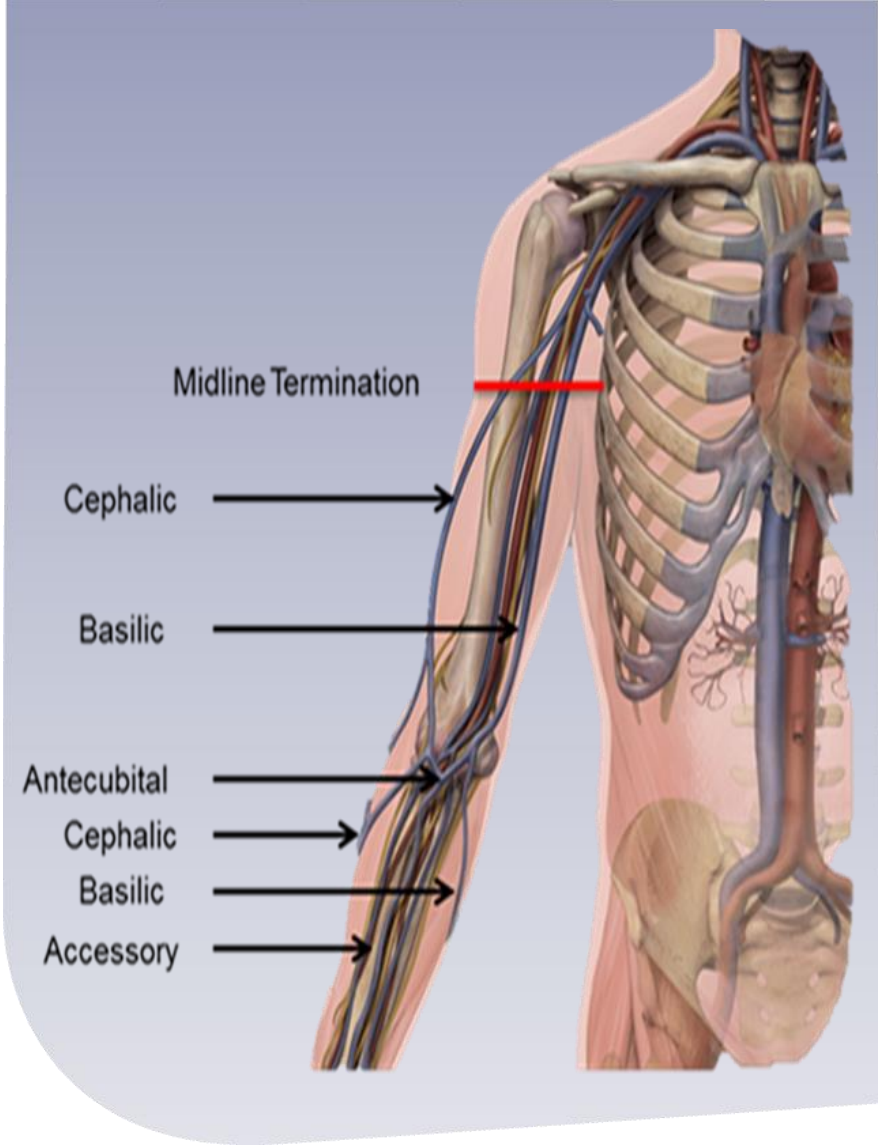
Device Selection



What is a Midline

A midline catheter is a peripheral venous catheter:

- 8-20 cm long
- Inserted preferably in the upper arm, secondarily the region of the antecubital fossa (INS 27,Pg. S54)
- Terminates at or below the level of the axilla and distal to the shoulder (INS 33,Pg. S65)
- Can be inserted in the basilic (preferred), median cubital, brachial, or cephalic vein (INS 27, Pg. S54)



[1]INS 2016 Standards. *Journal of Infusion Nursing*. Supplement to January/February 2016. Volume 39, Number 1S. ISSN 1533-1458.

Choosing a Midline Catheter

- Use cautiously with intermittent vesicant administration (INS 26, Pg. S51)
- Risks include: Undetected extravasation, undetected phlebitis, thrombophlebitis leading to venous thrombosis, infiltration and extravasation
- Vancomycin administered via midline for 6 days was found to be safe in one study (2)

- Avoid use with:
  - History of venous thrombosis
  - Hypercoagulability
  - Decreased venous flow to extremities
  - End-stage renal disease requiring vein preservation (INS 26, Pg. S51)

2.Caparas JV, Hu HP. Safe administration of vancomycin through a novel midline catheter: a randomized, prospective clinical trial. J Vasc Access. 2014;15(4):251-256.

Medication Assessment for Midline Catheter

Osmolarity:

- The number of osmotically active particles in a solution (INS Pg.S153)

Vesicant:

- An agent capable of causing tissue damage when it escapes from the intended vascular pathway into surrounding tissue (INS Pg.S155)

Irritant:

- An agent capable of producing discomfort (eg, burning, stinging) or pain as a result of irritation in the internal lumen of the vein with or without immediate external signs of vein inflammation (INS Pg.S151)

Including medication assessment ensures the clinician is following the principles of Vessel Health and Preservation

[1]INS 2016 Standards. *Journal of Infusion Nursing*. Supplement to January/February 2016. Volume 39, Number 1S. ISSN 1533-1458.

PICC & Midline Advantages

- Eliminate multiple venepunctures
- Offer increased haemodilution
- Cost-effective and time efficient
- Decreased risk of infiltration/extravasation
- May be inserted at the bedside
- Increased patient satisfaction
- Decrease or eliminate risks associated with insertion into the chest or neck

Disadvantages of PICC and Midline Catheters

- Require adequate peripheral veins
- Smaller gauge size when comparing PICCs to other CVCs
- Require special training and credentialing for clinicians
- Require practice and continuing education to maintain competency
- Midlines are appropriate for peripheral solutions only

Considerations When Placing a PICC or Midline

Assess the extremities for contraindications

Phlebitis

Infiltration or extravasation

Hematoma

Previous venepuncture sites

Dependent oedema

Localized infection near the proposed insertion site

Prior injuries, surgeries, vascular access device complications that have altered venous anatomy or venous return

Presence of dialysis grafts or fistulas

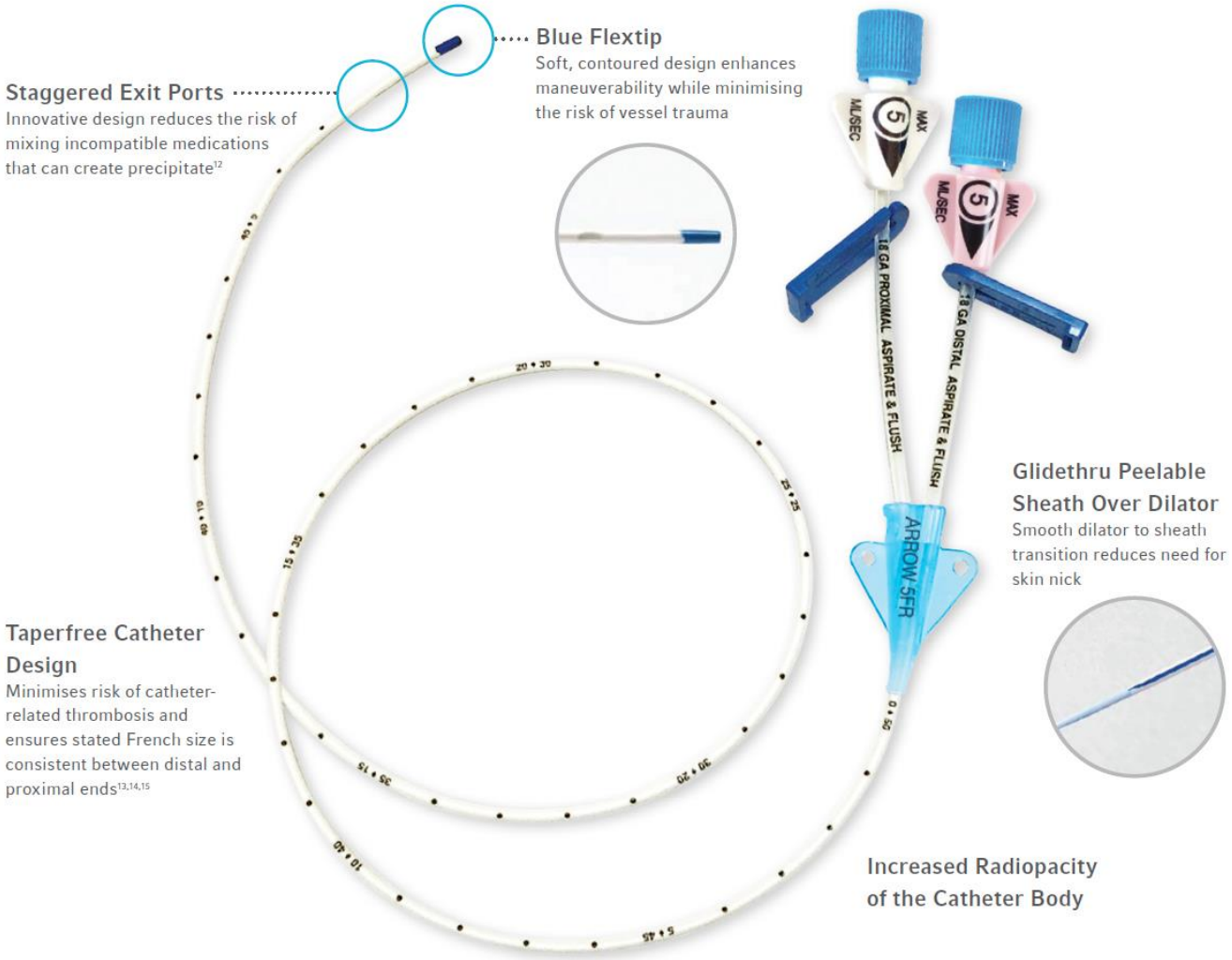
Impaired neurologic function

Types of PICCs / Midlines

- Silicone / Polyurethane
- Open Ended / Closed Ended
- Proximal valve/ Distal valve
- Gauge / Sizes
- Single Lumen / Multi lumen
- French/ Tapper French
- Pressure injectable/ NON pressure injectable

Giacomo, M. D. (2009). "Comparison of three peripherally-inserted central catheters: pilot study." British Journal of Nursing **18(1): 8-16.**

The Arrow® PICC Advantage



Vein Assessment and Site Selection

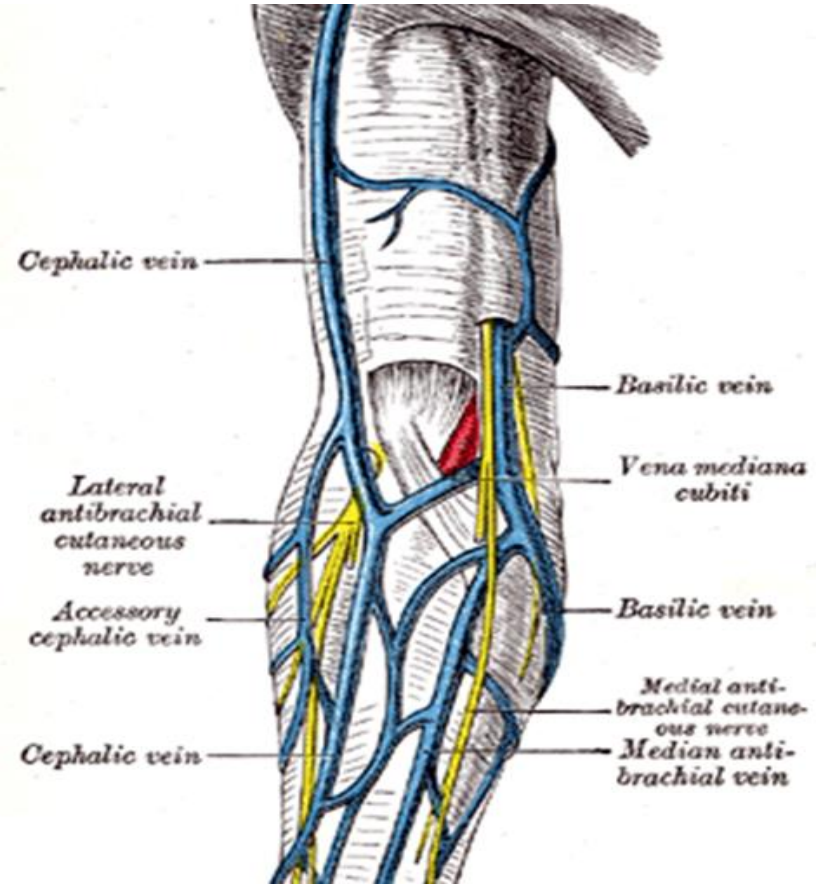
Basilic Vein

Median Basilic

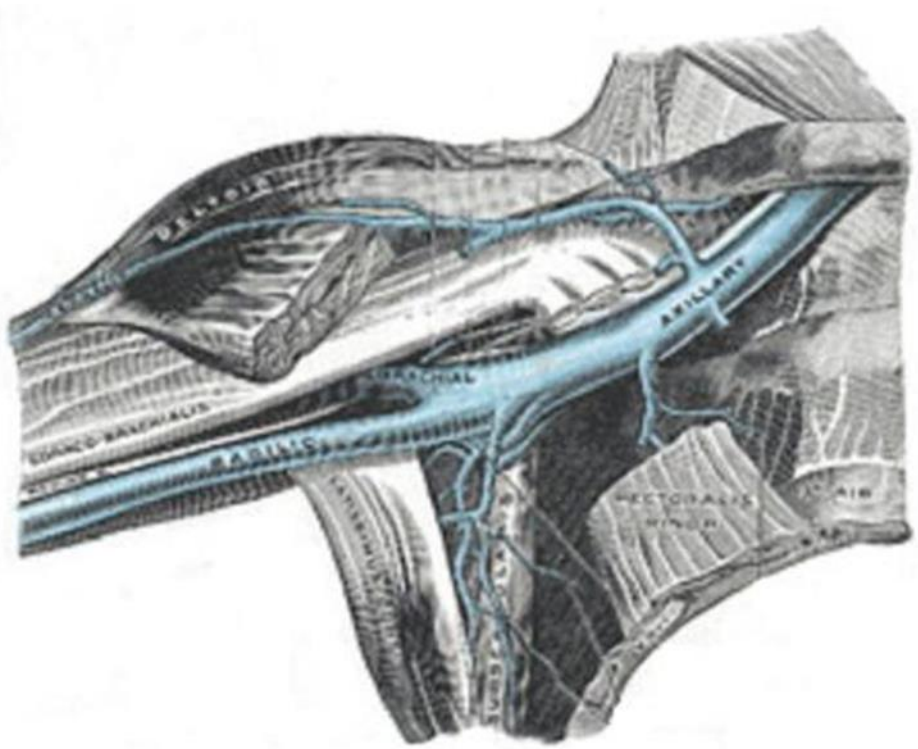
Cephalic

Median Cephalic

Accessory Cephalic



Veins of the Upper Extremity and Thorax



Placing a PICC can improve patients health outcomes

Reduces adverse events related to peripheral cannulas

Successful PICC Insertion

Right Vein

Right Insertion Site

Right Tip Position

Good Assessment

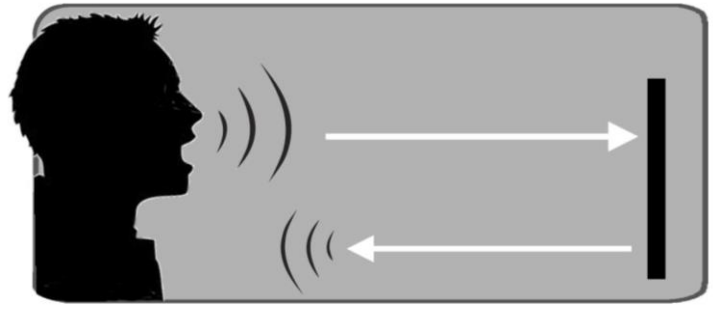
Right Line
Right Patient
Right Time™

Trends with PICCs

- Expanding Scope of Practice
- PICCs inserted with MI & Ultrasound at the bedside / procedure room
- ↑ CT, ↑ need for Power Injection via PICCs
- Saline Only Maintenance
- Need to monitor CVP via PICCs
- Ability to do a wire exchange
- Tip positioning technology

What is Ultrasound?

- Vibrations of the same physical nature as sound but with frequencies above the range of the human ear
- Noninvasive technique involving the formation of a two-dimensional image



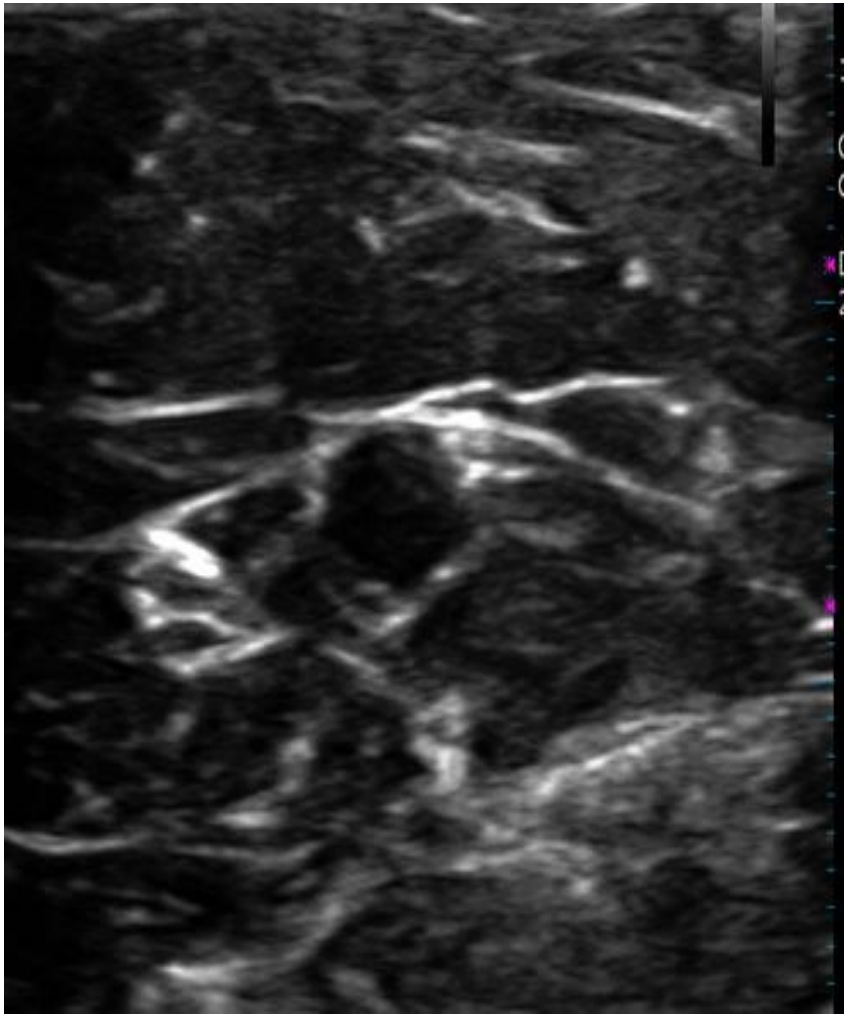
It compares to an ECHO . . .

Reflection of sound arriving at the source some time after the sound was generated

Ultrasound Image

Dark – less reflection of sound waves with low density structures creating weakest resolution

Light – more reflection of sound waves with high density structures creating strongest resolution



Advantages

- Promotes safety[3]
- Allows for real time visualization [2]
- Portable
- Increased insertion success rate [3,9]
- Less vessel trauma than with blind insertion[9]
- Ability to access deeper veins that are non-palpable
- Increased patient comfort and satisfaction

Additional Considerations

- Additional supplies required
- Equipment availability
- Extra training for use of ultrasound
- Learning curve dependent on user skills

Assessment

Vessel assessment prior to insertion

- Assures vein is patent
- Determines appropriate size/depth of vessel
- Characteristics of pathway and blood flow in vessel
- Determines the location of surrounding anatomical structures

Assessment of vessel after insertion

- Determines continued patency of vein
- Recognition of catheter related vessel thrombosis
- Troubleshooting

Ultrasound Equipment

Machine

- Body
- Controls
- Screen
- Transducer(s)
- Gel
- Probe cover
- Needle guides

Ultrasound Transducer

Responsible for:

- Emitting sound waves
- Receiving sound waves
- Sound waves bounce off solid structures in the body and reflect back to transducer
- Pass through liquid structures

Transducer

- Center of transducer is important for alignment of needle; the arrow faces clinician

- Side marking for orientation of probe to the screen of machine

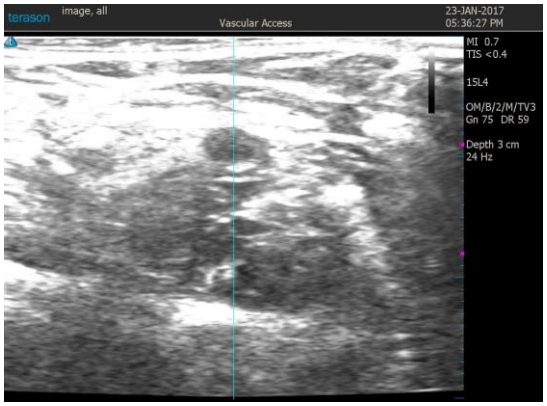
Using gel to optimize image

- Gel is the conductor required for transmission of sound waves
- Air interferes with conduction and distorts picture
- Sterile gel use during procedure

Gain

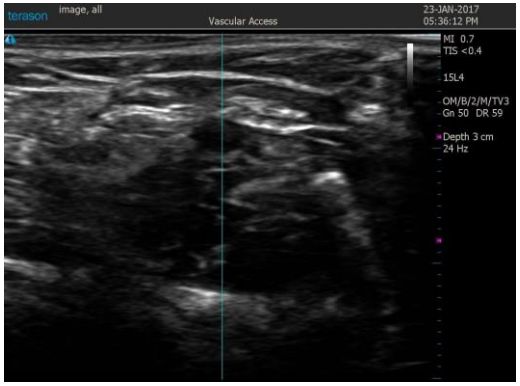
Used to adjust enhancement of the screen image

- Near field is most superficial or closest to the transducer
- Far field is deeper or farthest away from the transducer
- Optimal gain is a balance of near and far gain that is used to increase or decrease the overall brightness of an image



Gain is too bright

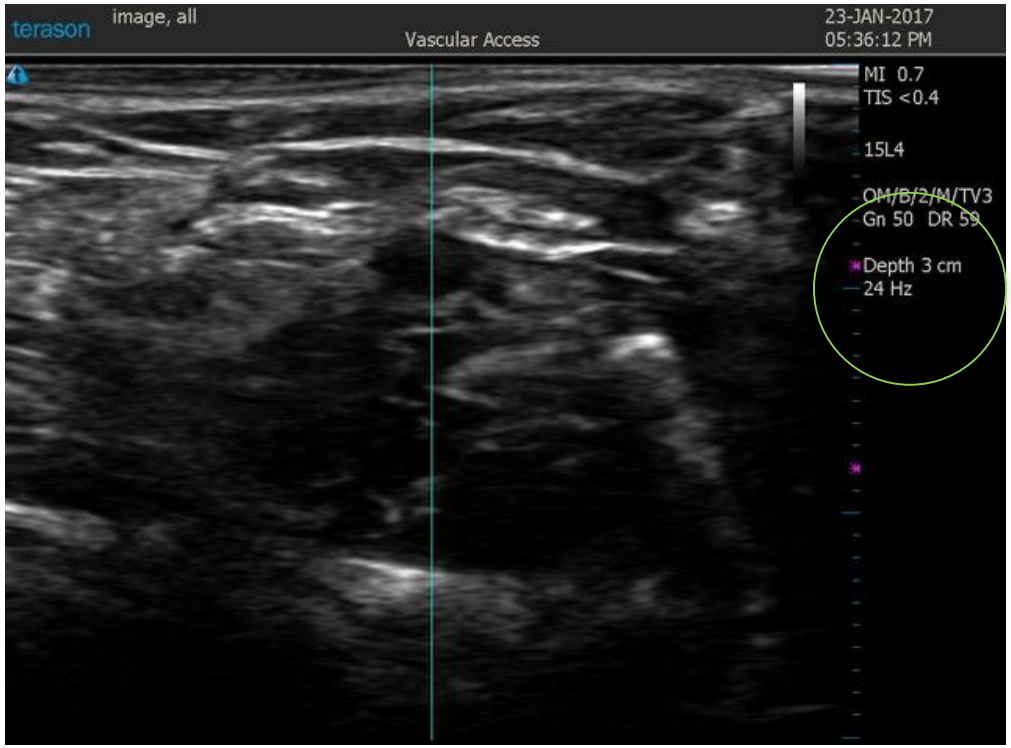
Gain is too dark



Optimal gain

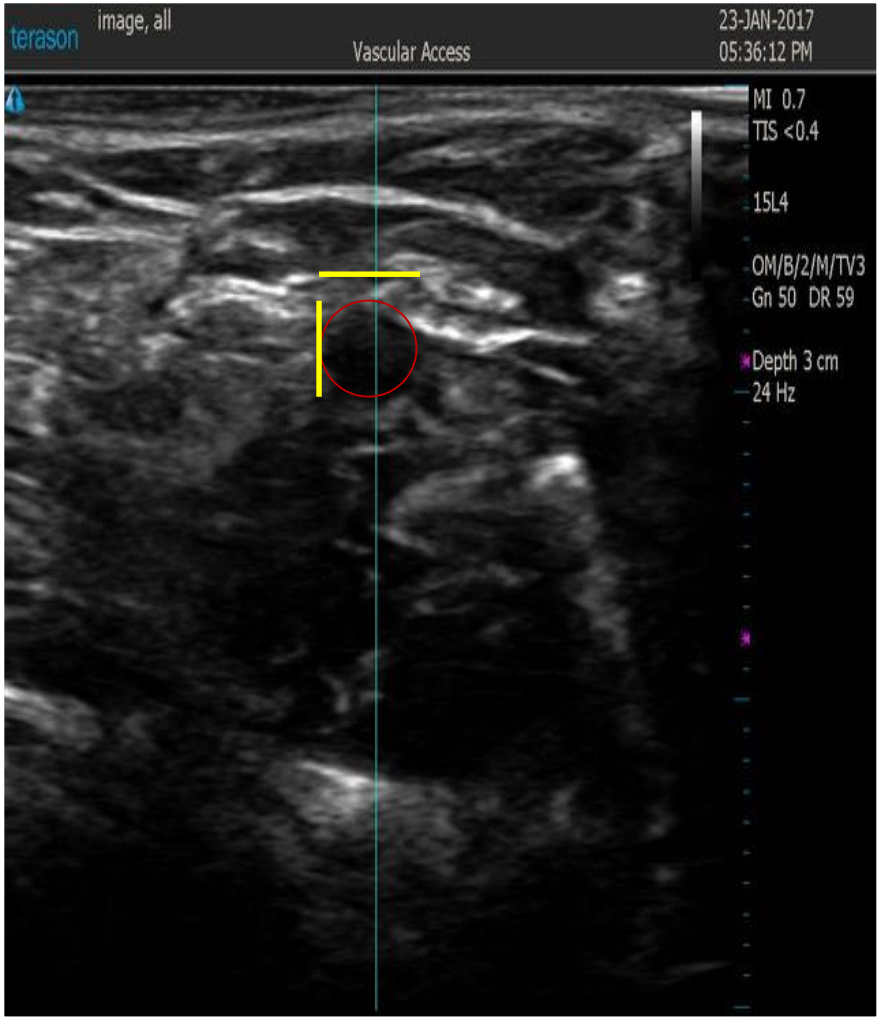
Depth

- Allows various depths of visualization within area
- Increasing depth narrows the screen, making the vessel appear smaller
- Depth markers identify vessel location in relation to surface of skin



Vessel Measurements

- Selecting the calipers
- Calipers measure the diameter of the vessel
- Choose a vessel that allows catheter to vessel ratio of 45% or less[1]
- Assess the vessels in a natural state, without a tourniquet



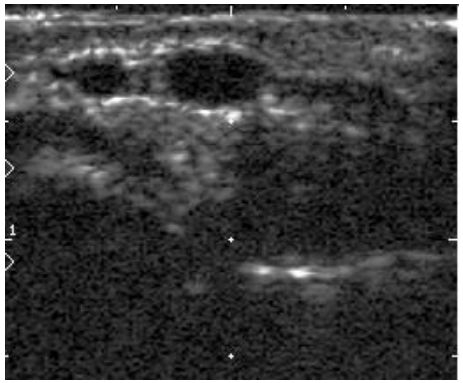
Ultrasound views

Transverse View (Axial)

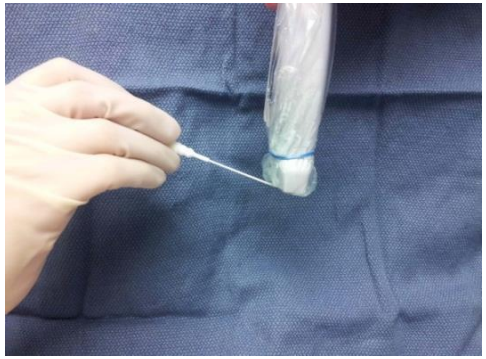
Longitudinal View (Sagittal)

Transverse view out of plane

- Transverse = Position the probe perpendicular to the vessel



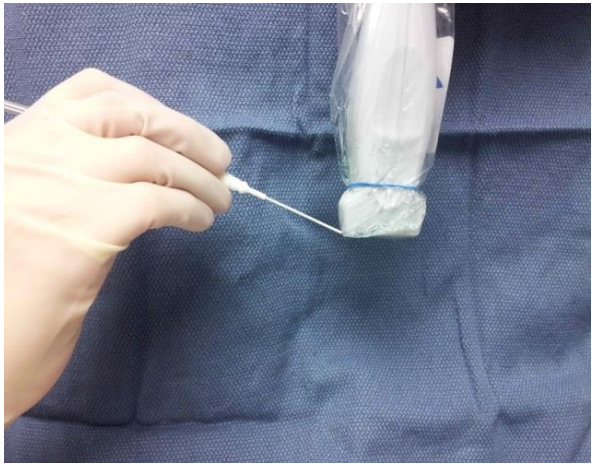
- Out of plane = Position needle perpendicular to the probe

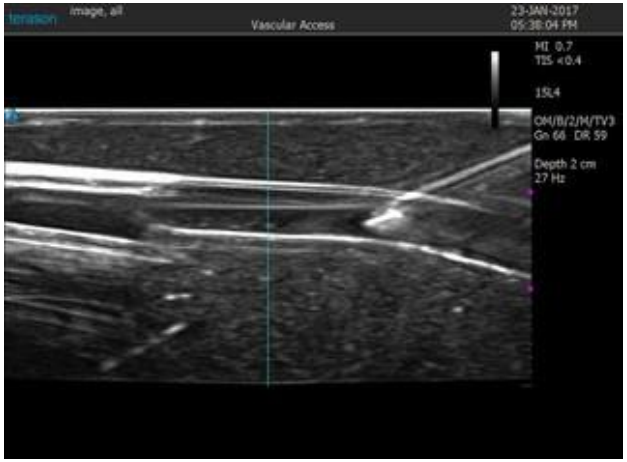


Longitudinal view in plane

- Longitudinal = positioned probe vertically and parallel to the vessel

- In plane = Position of the needle parallel to the probe





Identifying differences of veins and arteries

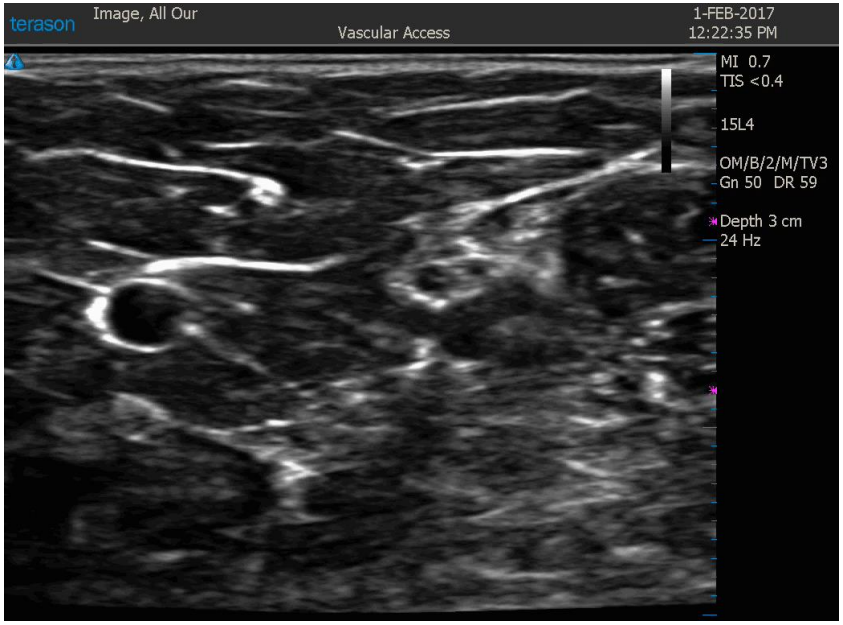
Both circular black structures

Veins are:

- Easily compressible
- Should not be pulsatile
- Thinner walls

Arteries:

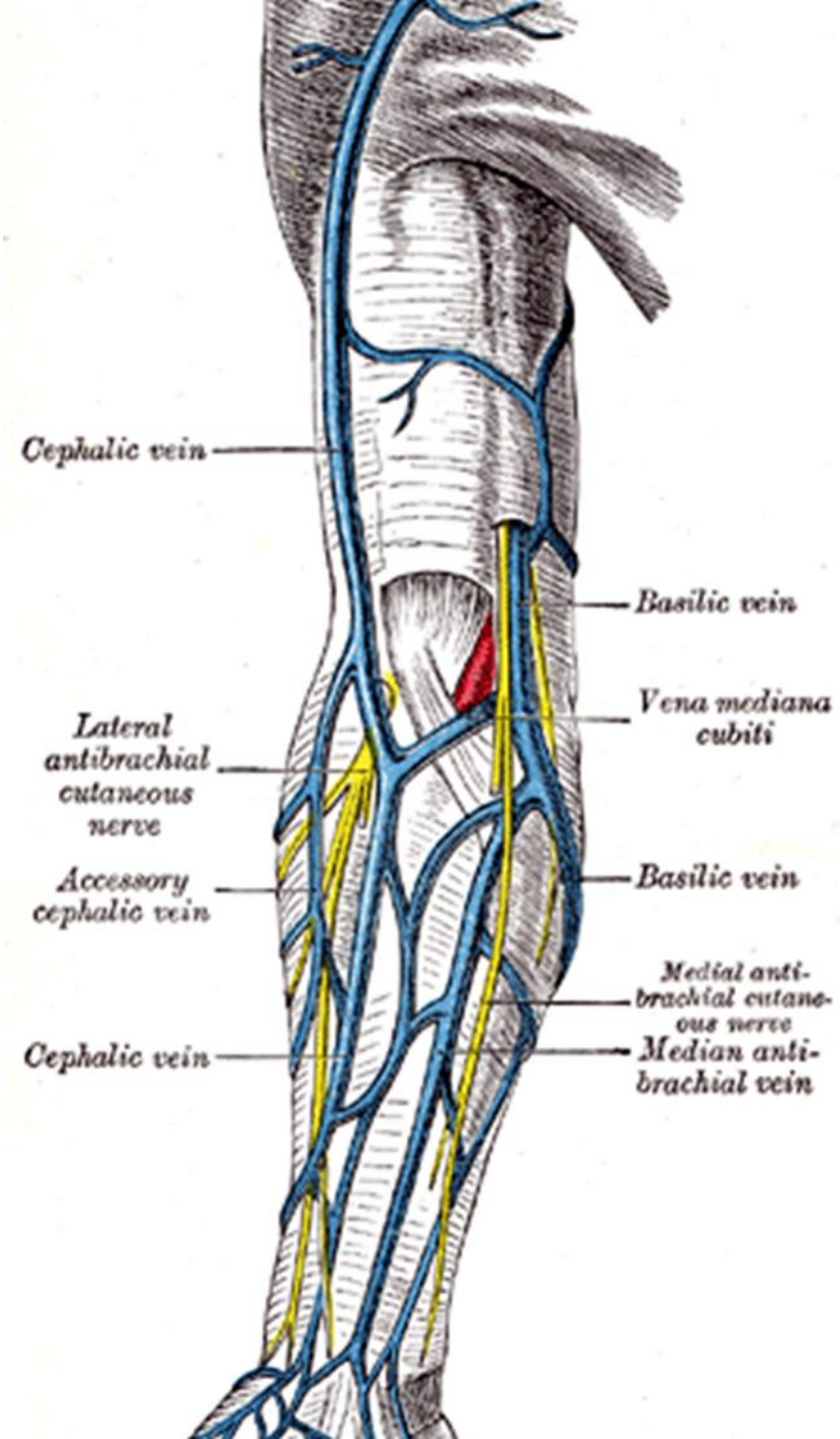
- Pulsate
- Difficult to compress
- Arterial walls appear thicker



Anatomy of upper arm

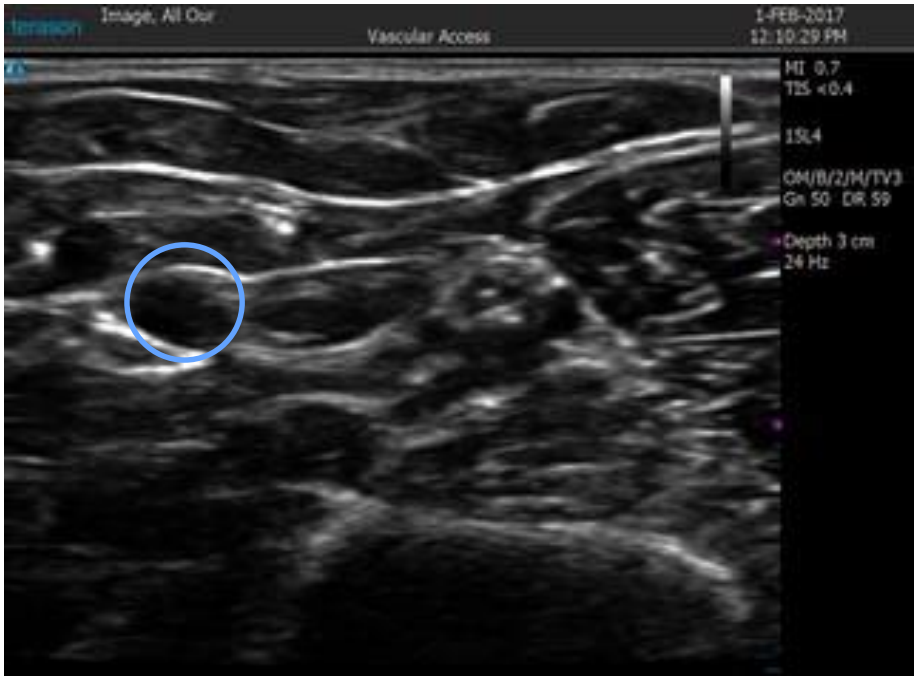
Significant upper extremity structures

- Veins
  - Basilic
  - Brachial
  - Cephalic
- Artery
  - Brachial
- Nerve
  - Median cutaneous



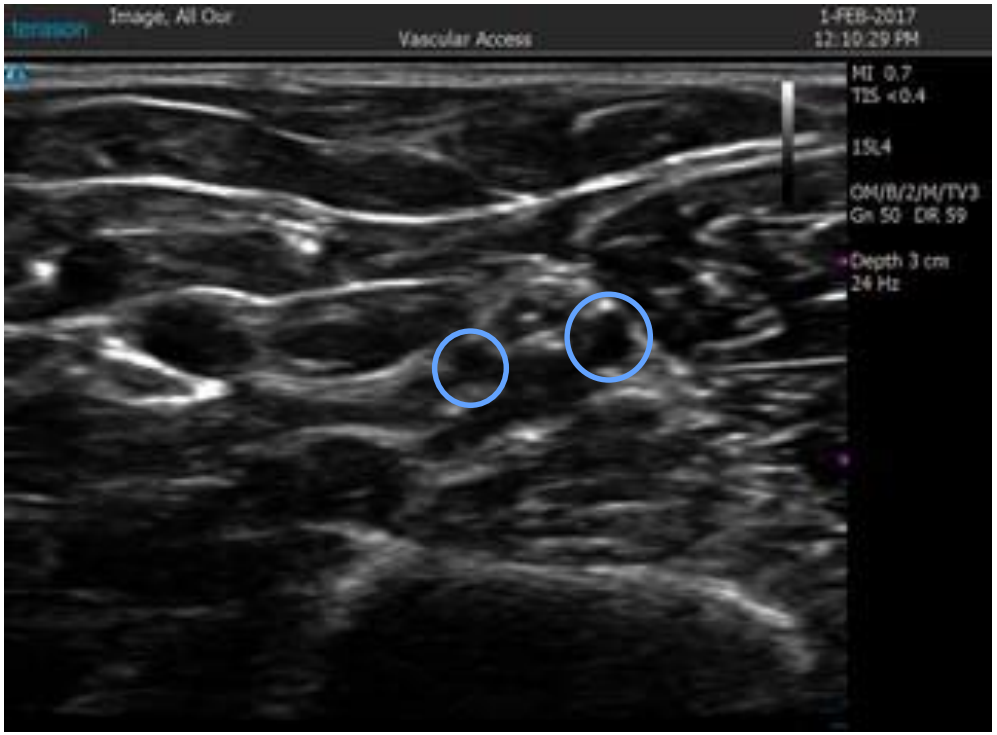
Basilic vein

- First vein of choice for PICC placement[1]
- Vein located in the inner aspect of upper arm
- Lies away from arterial and nerve structures
- Progressively gets larger towards central circulation
- Joins brachial vein(s) in upper arm, creating the axillary vein



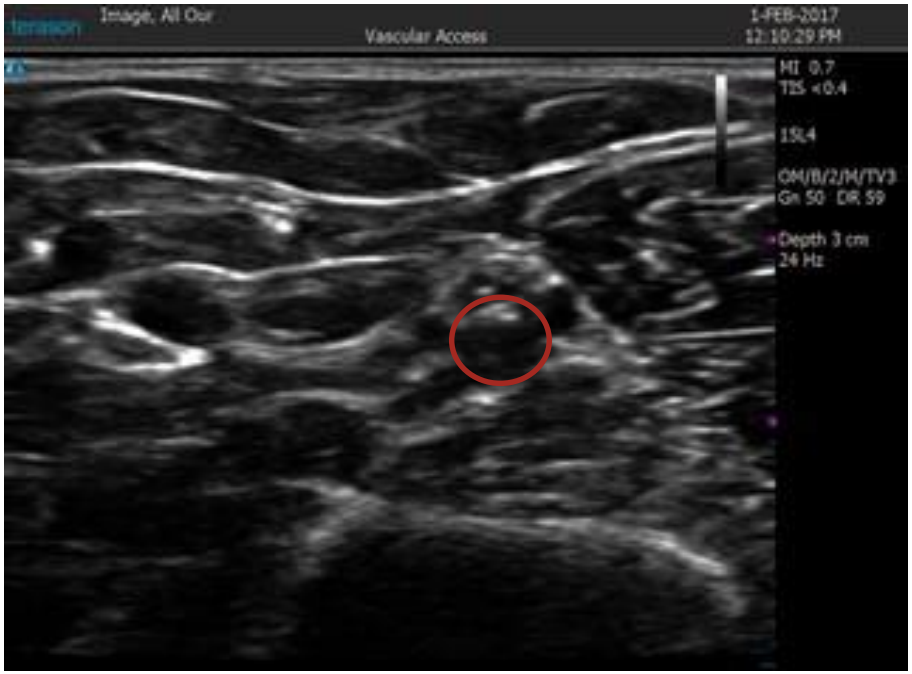
Brachial vein

- Deeper vessel
- Size varies
- Close proximity to median nerve and brachial artery



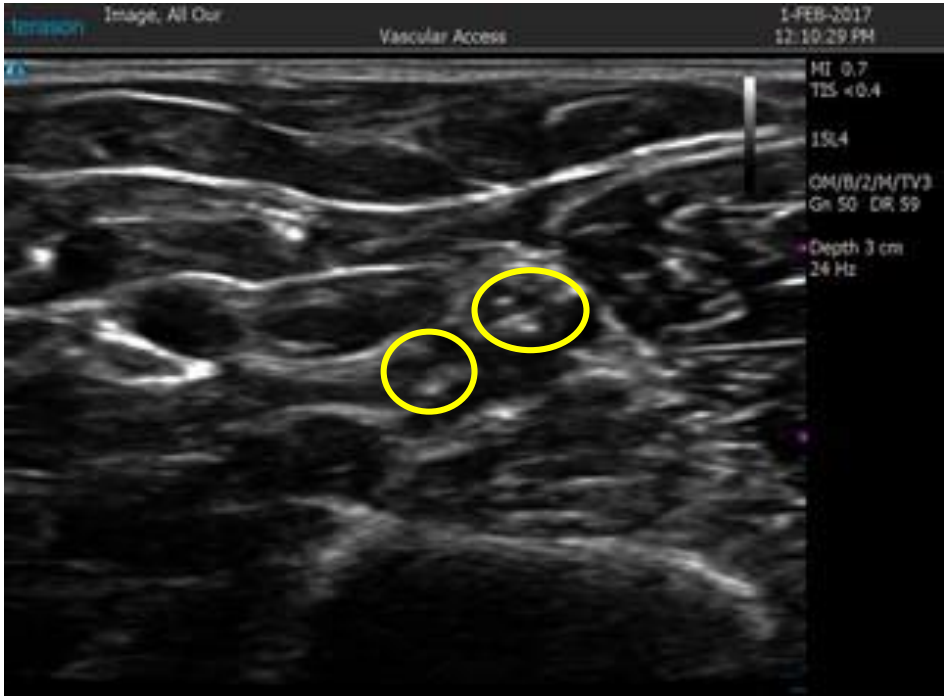
Brachial artery

- Pulsatile when firmly compressed
- Formed when the radial and ulnar artery join at the antecubital area
- Lies between the biceps tendon and the median nerve
- Surrounded by the brachial vein(s)
- Above brachial artery is median nerve bundle



Nerves

- Lies near the brachial artery
- Appears as “cauliflower” bundle near the brachial artery
- Identify nerves prior to cannulation
- Assess for post insertion pain



Summary

- Pre insertion assessment of:
  - Vessel anatomy
  - Vessel patency
  - Surrounding anatomical structures
- Ultrasound is the key for safe device insertion
- Education and training is essential
- Access to proper equipment and supplies is necessary

References

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SOP 47. Central Vascular Access Device Tip Location

Practice Criteria

- Tip should be in lower segment of SVC at or near CAJ
- Deeper tip location (near tricuspid valve or ventricle) is associated with cardiac arrhythmias (II)

- Use ECG technology in real time for tip location (II)
- ECG technology is more accurate, allows more rapid initiation of infusion therapy and reduces cost (II)
- Tip confirmation by chest radiograph when ECG unavailable

- Document CVAD tip location in medical record
- Place ECG tracing, radiology report or other appropriate report in the medical record

Infusion Therapy Standards of Practice 2016 www.ins1.org/

Tip Positioning Technology

Tip Positioning

- ECG Interpretation P Wave (Arrow VPS Rhythm)

Navigation + Tip Positioning

- Magnetic Tracking (Sherlock 3CG & Arrow VPSR)
- *Doppler (Arrow VPSG4)
- ECG Interpretation “R” Wave (Arrow VPSR)

**Not registered or available in ANZ*

ECG Interpretation for Tip Position of CVCs

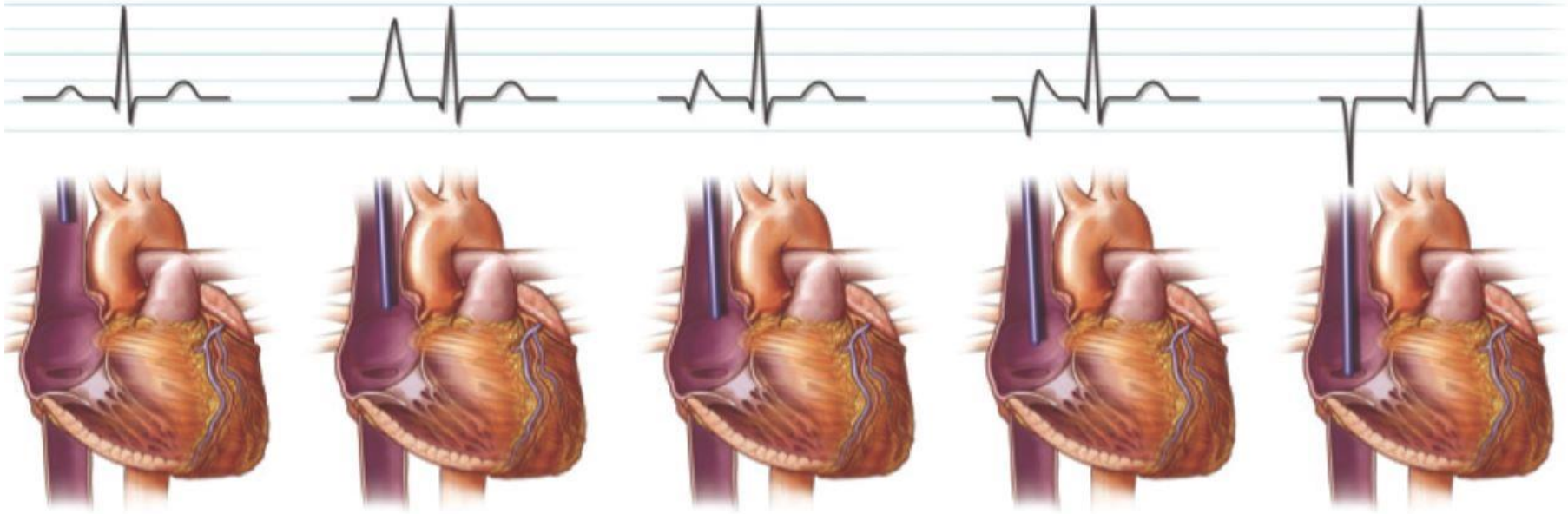


Figure 1

No evident P-wave changes indicates catheter is not in acceptable position.

Figure 2

A P-wave at its maximum height will indicate the catheter is in the lower 1/3 of superior vena cava/ right atrial junction.

Figure 3

A downward deflection on the leading edge of the P-wave indicates the catheter entering the right atrium.

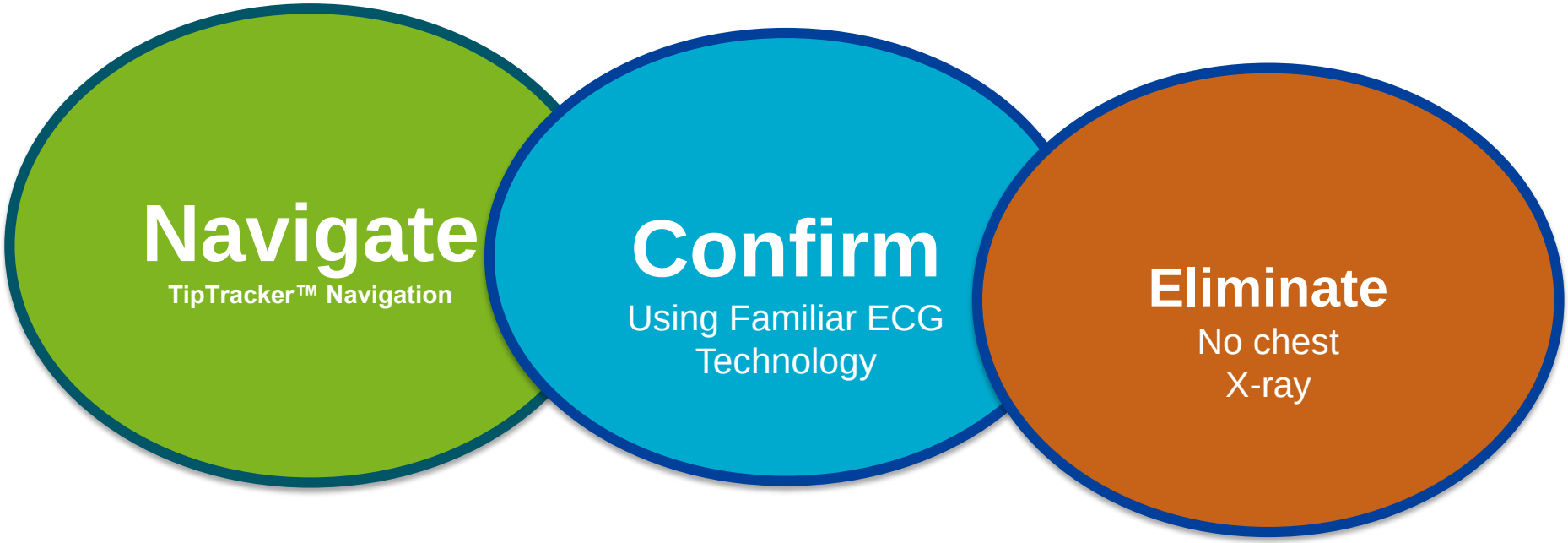
Figure 4

A biphasic P-wave indicates the catheter is within the right atrium.

Figure 5

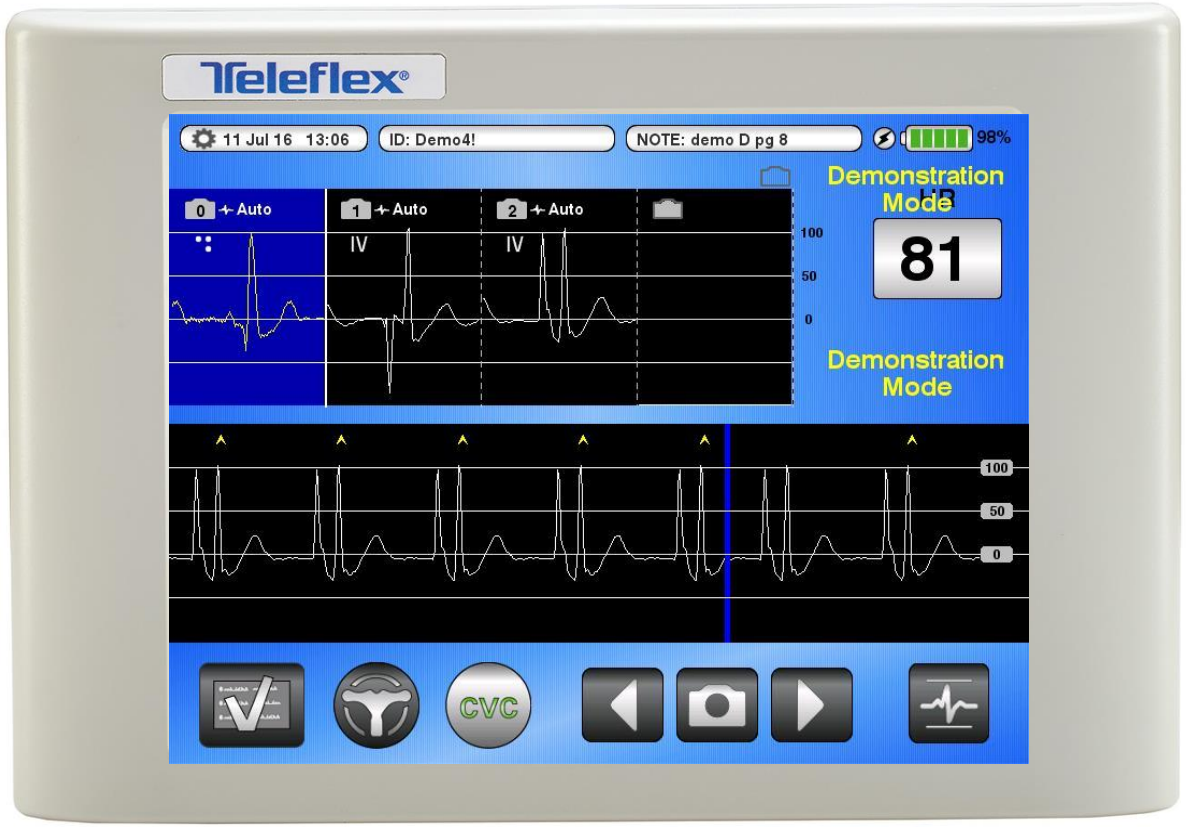
An inverted P-wave indicates a catheter is approaching the right ventricle.

Arrow VPS Rhythm

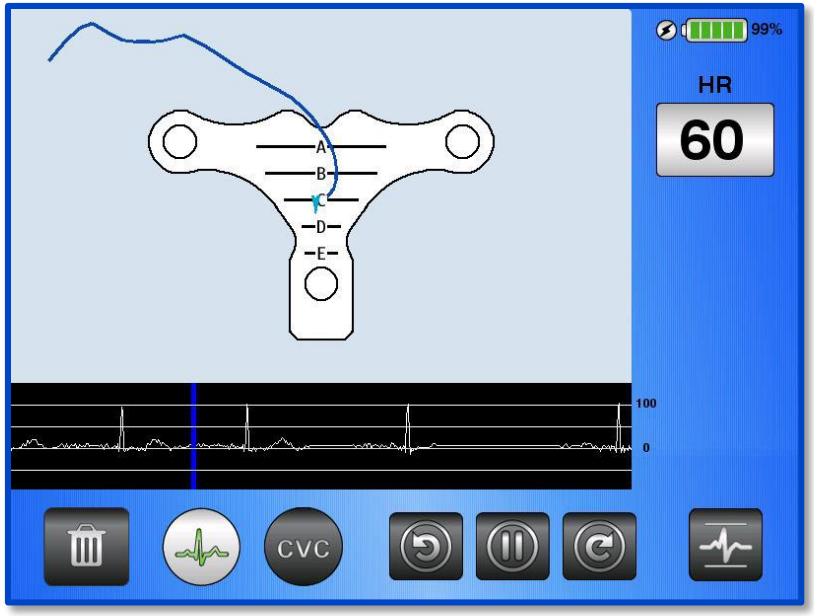


Find Your Rhythm

P Wave Verification of Tip Position



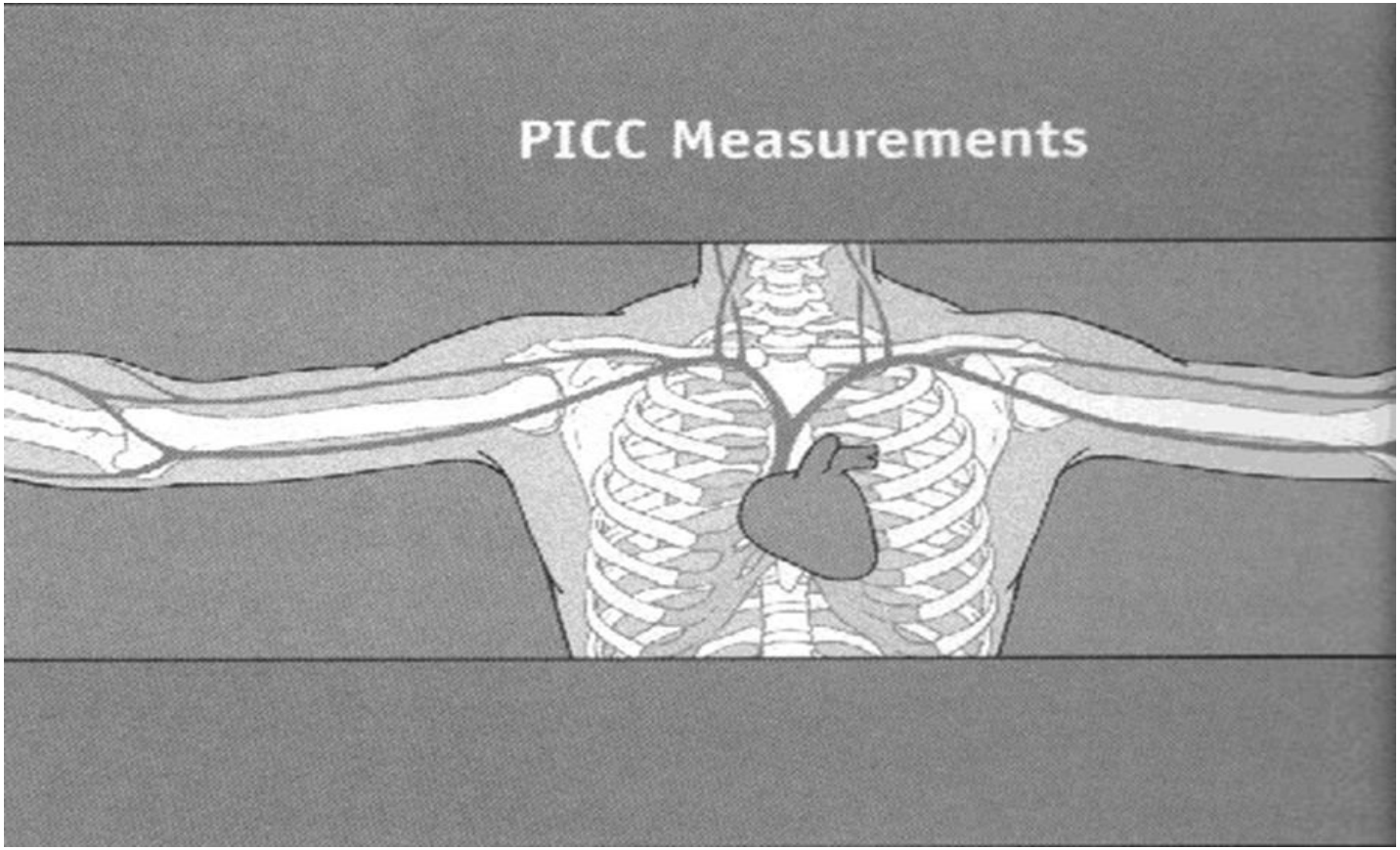
Navigation



Eliminate Chest X-Ray

Group	Guideline	Method of Confirmation
NSW Health Policy (2011) (Review September 2016)	It is reasonable to expect that a CVC tip should be: 1. in the superior vena cava 2. above the cephalic limit of the pericardial reflection 3. at a level corresponding to the carina on a chest radiograph	Chest X-Ray
INS (2016) (Infusion Nurses Society)	Lower segment of SVC at or near CAJ	1.ECG 2. Chest X-ray
SIR (2000) Society for Interventional Radiology	SVC / RA Junction	1. Fluoroscopy 2. Chest X-ray
AAGBI (2016) (Association of Anaesthetists of Great Britain & Ireland)	Lower SVC or upper RA	1.Fluoroscopy 2.ECG 3.Chest X-ray
ASA (2012) (American Society of Anaesthetists)	No recommendation	-Acknowledge ECG as a effective method of confirmation -Chest X-ray & fluoroscopy are useful
WoCoVa Consensus Statement (2013)	At or near the CAJ	• Fluoroscopy • ECG • Chest X-Ray

How you measure . . .



To the SVC/ CAJ.....

Three ways to Measure

Palpate intercostal spaces

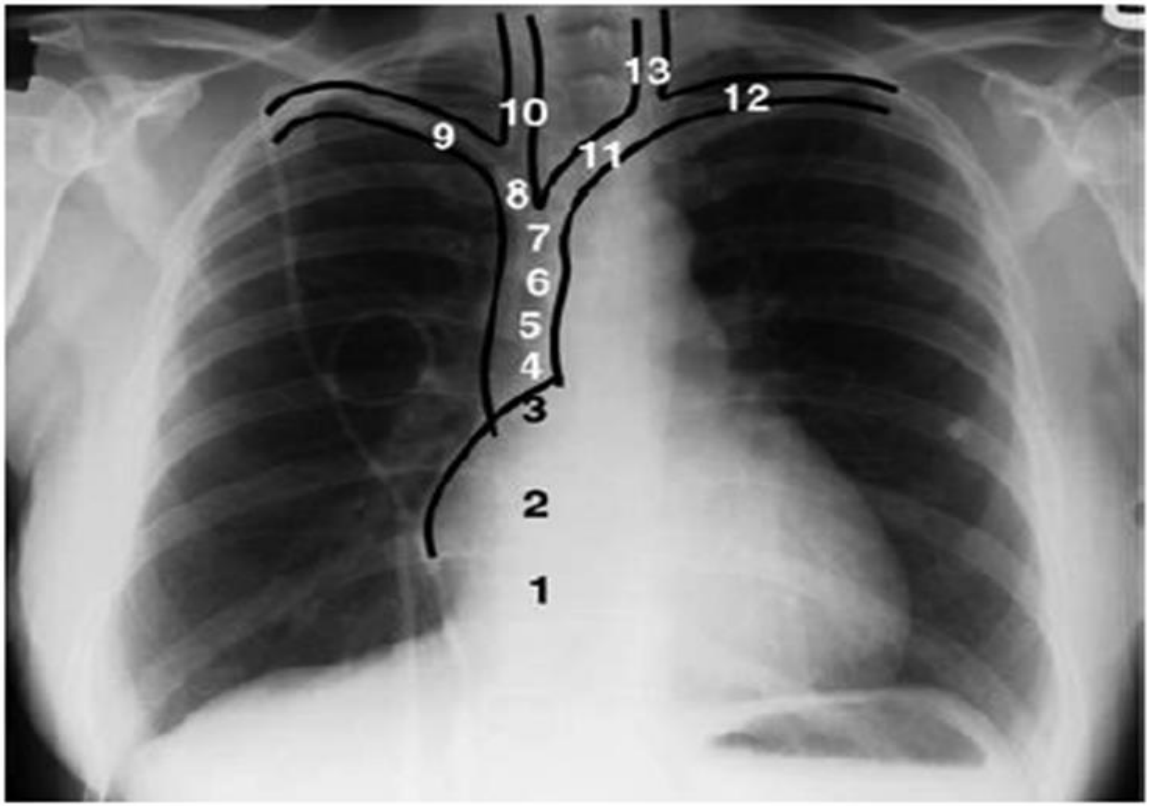
Sternal angle (angle of Louis)

Suprasternal notch and xiphoid process

Oncology Nursing Society, **Access Device Guidelines, Recommendations for Nursing Practice and Education,** 1996 pg11

Lum P, (2004) *A new formula -based measurement guide for optimal positioning of CVCs.* ***JAVA, 9:2***

PICC Tip Positioning



Cadman, 2004. Used with permission granted by Elsevier –RightsLink 10.20.10.

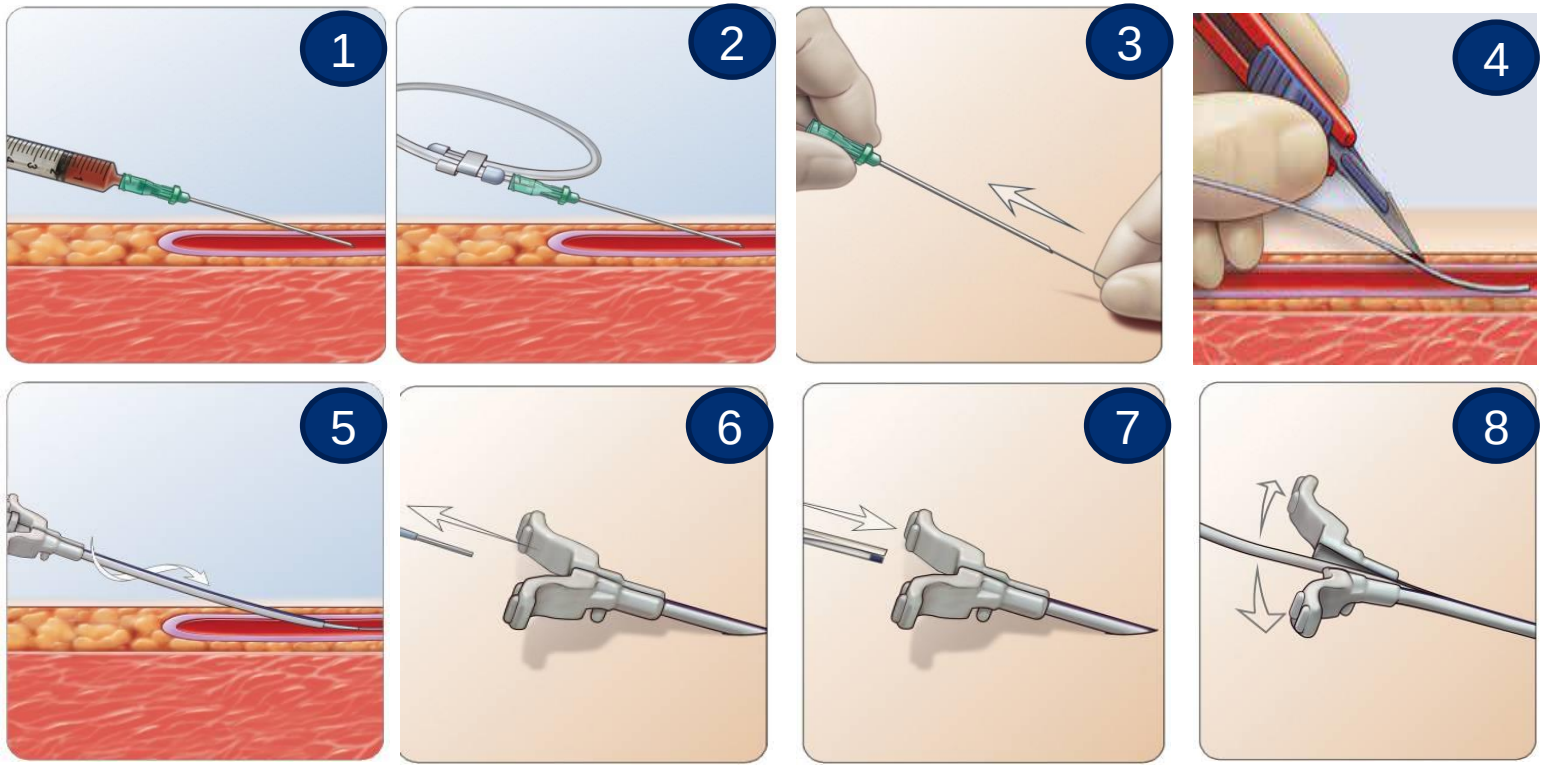
Types of PICC Insertion

Modified Seldinger

Seldinger

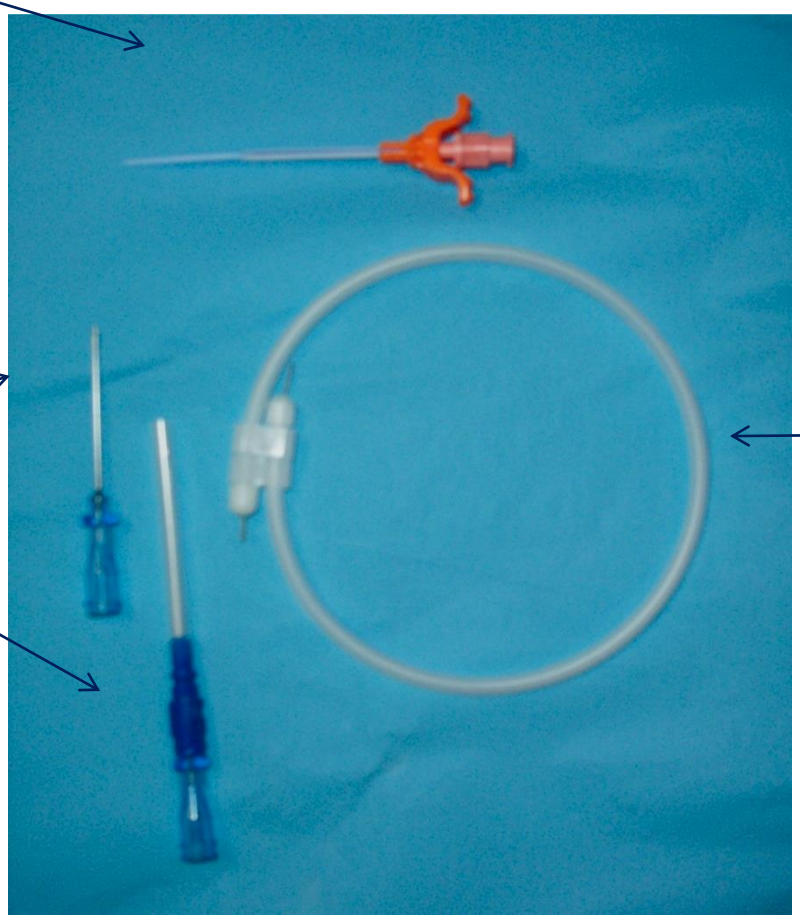
MODIFIED SELDINGER TECHNIQUE

Uses a 21 gauge needle to access vein followed by introduction of a soft-tipped guidewire. Needle is removed and peel-away sheath/dilator assembly inserted over guidewire. Guidewire and dilator are removed; catheter is threaded through introducer to final tip location



MST / MICRO-INTRODUCER

3. Dilator + Peel Apart Introducer



2. Guidewire

1.Small Needle or Cannula

Advantages of MST Insertion

Less Trauma during insertion

- Preferred method with US
- Enables insertion site above antecubital fossa
- Higher Success Rate
- Happier Patients

Tips for Working with Guidewires

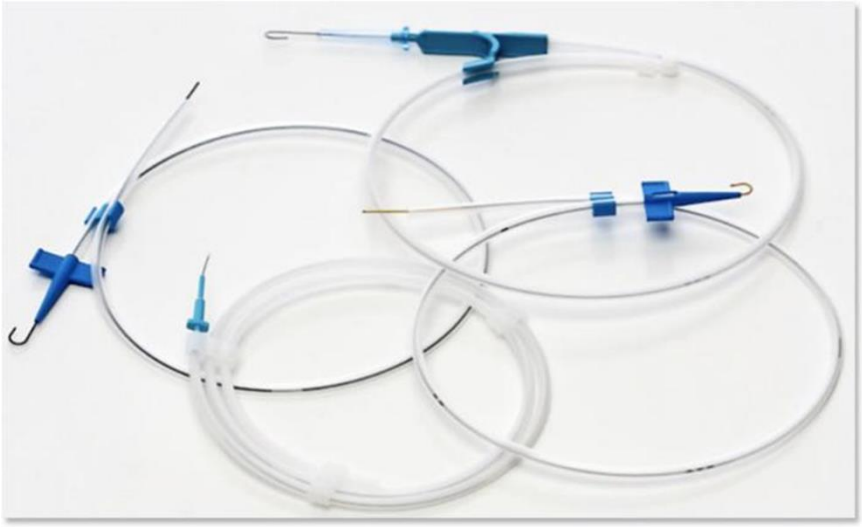
Respect the angle of the wire. The guidewire sits at a particular angle

Maintain a slight back traction on the wire. This helps the dilator and/or catheter slide over the wire properly

Monitor for kinks. If the wire is not advancing smoothly or a dilator is not inserting properly, a kink is the likely cause.

Advance the guidewire slowly in short strokes, 1-2 centimetre increments

Do not wrap the wire over fingers or wrist.



Placement Wire (Stylet) and Guidewire Considerations

Stylet

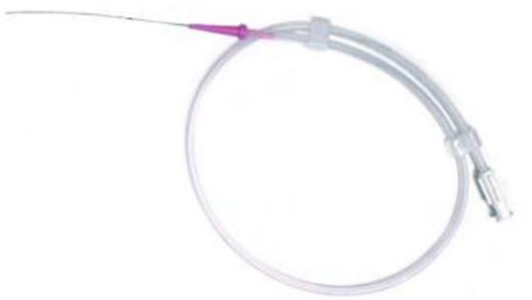
Thin flexible wires placed within catheters to facilitate introduction

Guidewire

Thin flexible wires inserted into the vein to allow for sheath/dilator insertion

Soft flexible tip

Never cut a stylet /placement wire or guidewire



Review Procedure

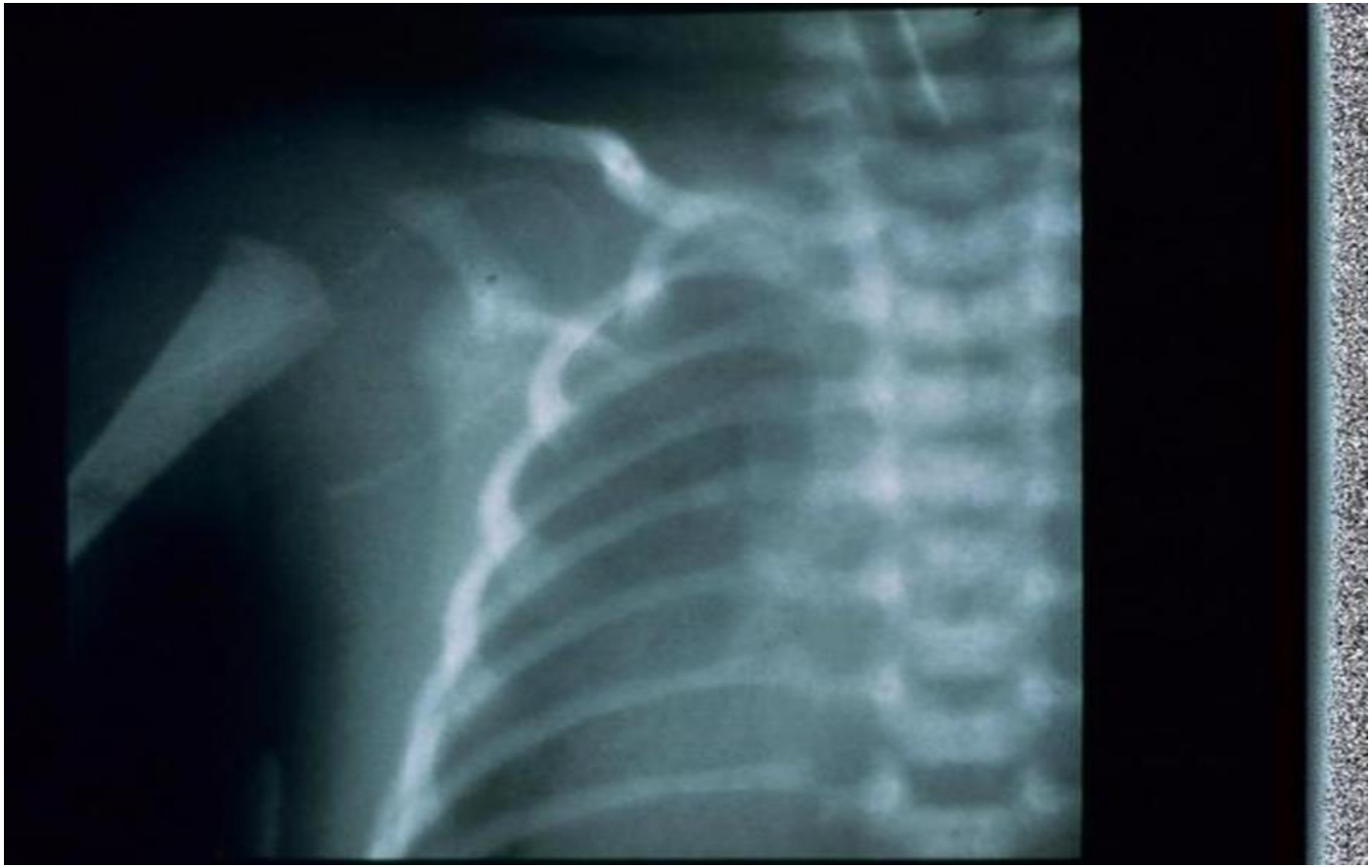
Which vein / s

Name the 2 insertion techniques

Measurement

Full Barrier Precautions

Skin Prep



The Right Line › The Right Patient › The Right Time › The Right Securement

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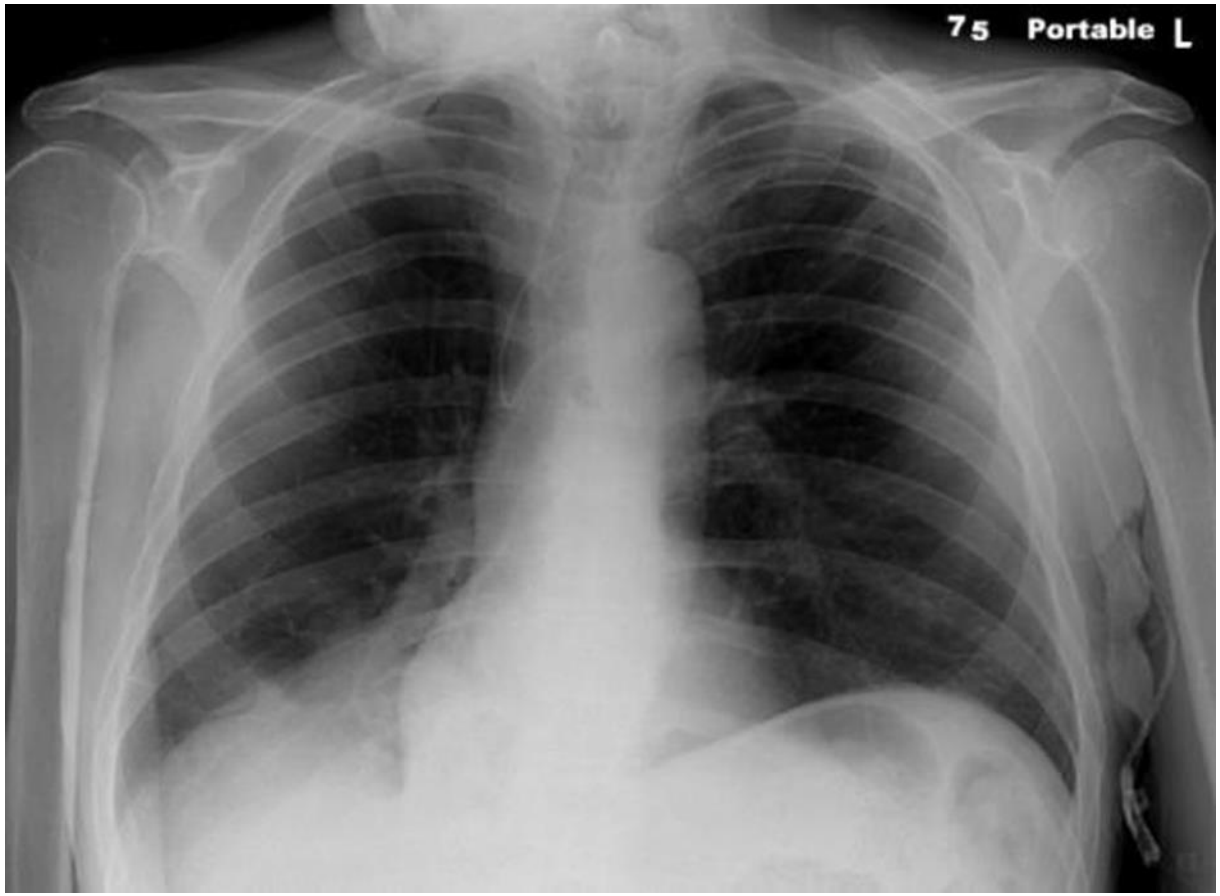
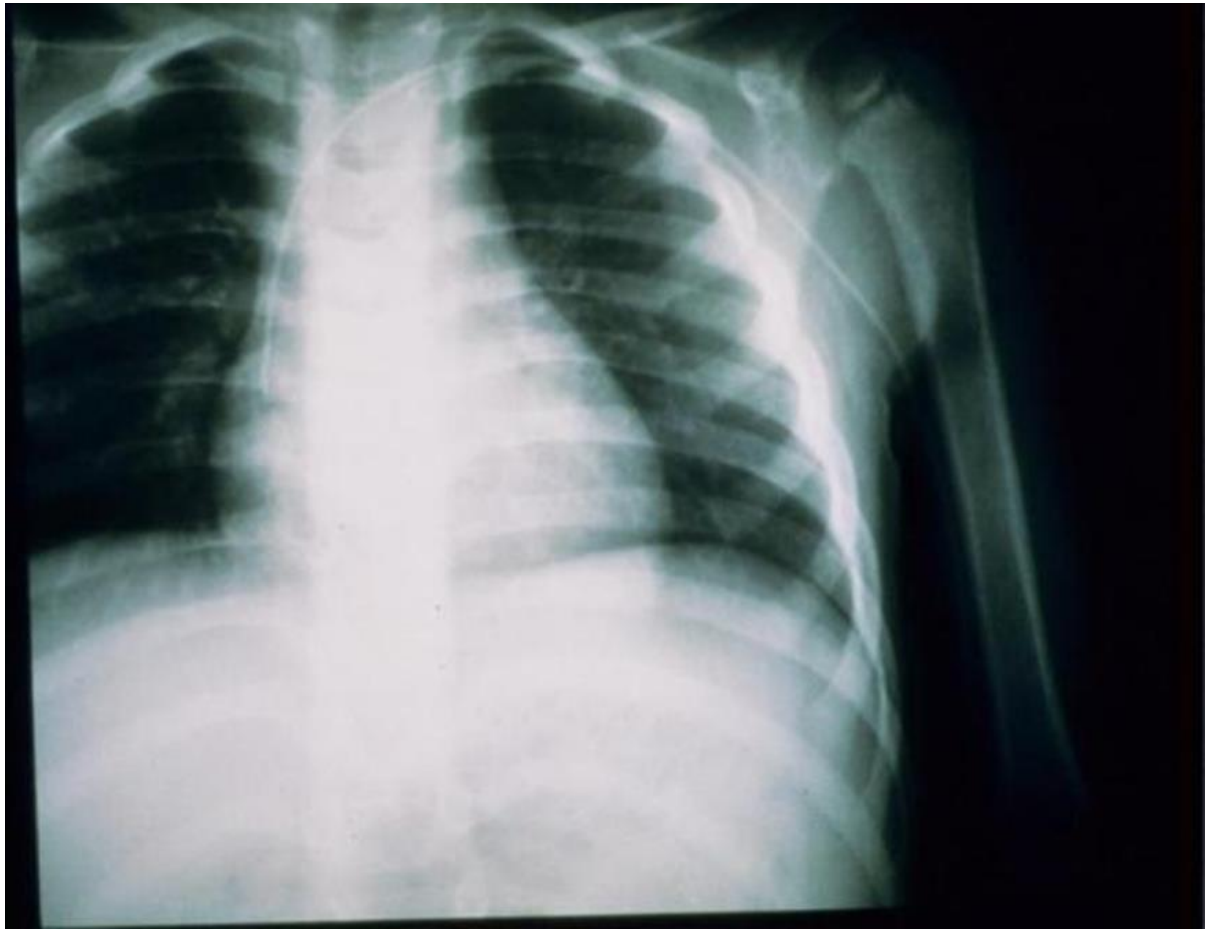


The Right Line › The Right Patient › The Right Time › The Right Securement



The Right Line › The Right Patient › The Right Time › The Right Securement

Post Procedure

X-ray

Tip location technology required documentation

Securement

Documentation

Hand over

Practice Recommendations to determine Tip Position

Chest X-Ray

Ongoing position check:

Aspirate & Flush Line pre & post drug administration

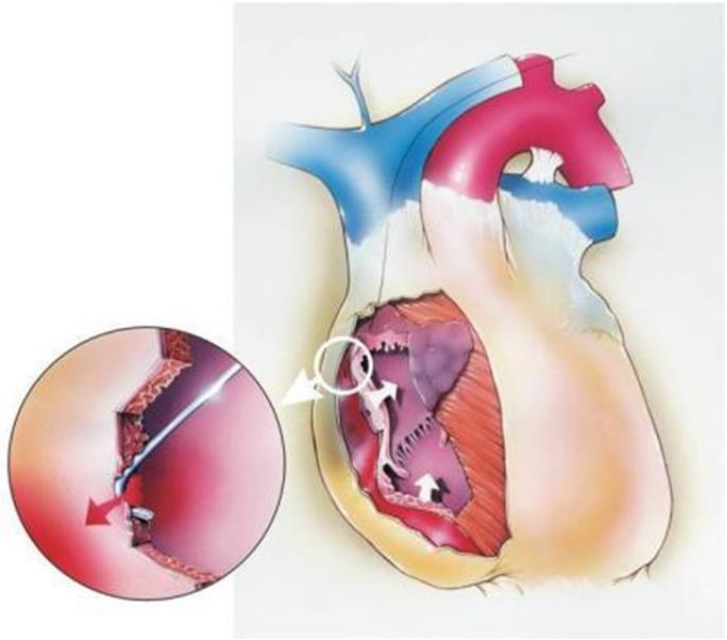
Compare how much catheter is outside the patient compared to insertion notes

Ensure good securement

Consequences.....

To Far in.....

- Cardiac Arrhythmias
- Cardiac Tamponade



Phlebitis

Mechanical

Use the smallest gauge PICC

Use the Basilic Vein

Have the tip in the SVC

Insert the PICC with minimal movement @ insertion site

Ensure good securement of PICC

Chemical

Catheter to vein ratio

Adequate hemodilution

Appropriate pH and Osmolality for device

Vessel Diameter and Flow

		Radius of Vessel (mm)[4]	Length (CM)	Actual Diameter	Approx. mL/Min.
Cephalic		3^4	38 cm	2-4 mm	81
Basilic		4^4	24 cm	4-6 mm	256
Axillary		8^4	13 cm	16 mm	4,096
Subclavian		9.5^4	6 cm	19 mm	8,145
SVC		12.5^4	7 cm	20 mm	24,414

Types of Occlusions

Reasons for Occlusion:

Mechanical:

Kink in the catheter

Positional – the catheter rests up against the vessel wall preventing flow

Catheter malposition secondary to poor dressing technique

Ruptured catheter or Migration

Non-Thrombotic:

Intraluminal obstructions caused by: medication precipitates such as lipids, incompatible infusates/medications

Poor flushing volumes in between incompatible medication administration

Thrombotic:

Intraluminal thrombus

Extraluminal fibrin sleeve formation

Mural thrombus (DVT)

Complete occlusion of the vessel

Assessment & Detection of CVAD Occlusions

Flushing (Resistance)

Aspiration (Blood withdrawal / Patient position)

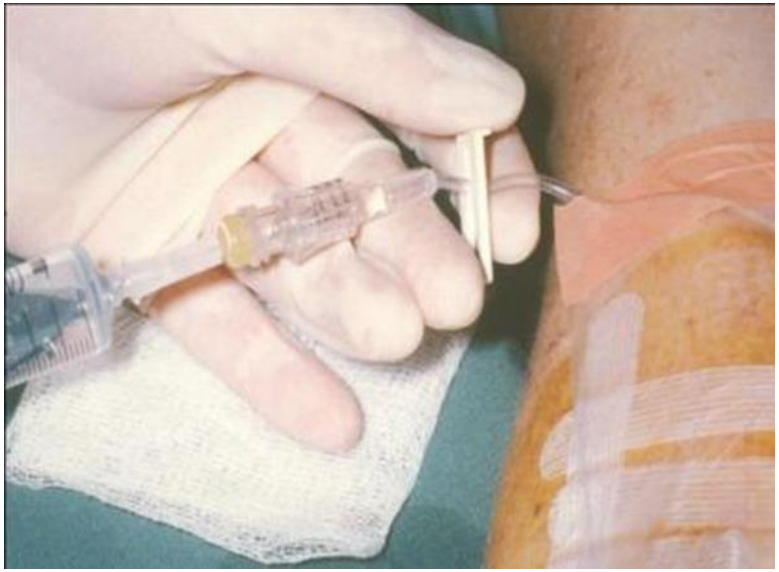
The patient

Check the external catheter

Infusion Regimes

X-Ray

Flushing



Hadaway, L. M. R. N. C. C. (2006). "Technology of Flushing Vascular Access Devices. [Article]. "Journal of Infusion Nursing May/June **29**(3): 137-145.

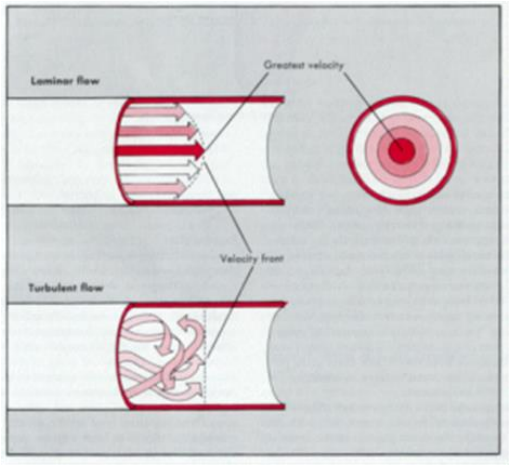
Flush Techniques

Pulsatile flushing to create turbulence and clean the inside of the catheter

Positive Pressure

- “Clamp technique” or positive pressure displacement devices

If using positive displacement devices **DO NOT** clamp until syringe is removed from injection bung



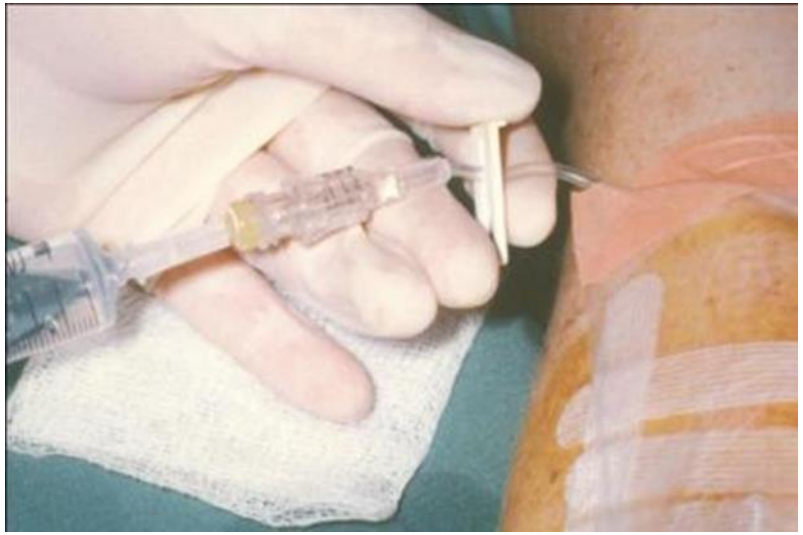
Tips for Securement

Attach securement no more than 2 -3cms from insertion point

Clean skin area with preferred antiseptic, allow to fully dry prior to application of securement. (Clip if hairy)

Minimise movement to reduce risk of migration

Dressing




MALPOSITION
Insertion Related Complications
GOAL
ZERO
Post-Insertion Complications
INFECTION
THROMBOSIS

Infection Prevention

Full Barrier Precautions with Insertion

Use Aseptic Technique for all Manipulations

Disinfect skin using a >0.5% Chlorhexidine & Alcohol based solution

Know your Products

Wash thy hands

Catheter Removal

Removal by “qualified” individuals

Removal procedure

Patient supine, HOB elevated

Maintain insertion site below level of heart

Remove dressing

Remove the catheter gently and slowly in 2-4 cm increments

Have patient hold breath as catheter exits insertion site

Cover the insertion site with a sterile, occlusive dressing

Measure and record the length of the catheter

Document the procedure

THE TELEFLEX ACADEMY

Thank You

Thank You

Teleflex®