# Vascular Access Device Planning

## Infusion Therapy Standards of Practice

The appropriate type of vascular access device (VAD), peripheral or central, is selected to accommodate the patient's vascular access needs based on the prescribed therapy or treatment regimen; anticipated duration of therapy; vascular characteristics; and patient's age, comorbidities, history of infusion therapy, preference for VAD location, and the ability and resources available to care for the device.

The most appropriate VAD device selection should occur as a collaborative process between the clinicians, patient and patient caregivers. The device selected should be the smallest outer diameter with the fewest number of lumens and be the least invasive for the prescribed therapy. Consideration of peripheral vein preservation should always be a factor in VAD decision making.

INS Standards of Practice 26.1, 26.2, 26.3, 26.4 page S51

Selecting the appropriate device for a patient is a critical part of a clinician's job. These materials are being provided for your information only and are not a substitute for clinical judgment.

## Organizations:

AVA: Association of Vascular Access
AVAinfo.org

INS: Infusion Nurses Society
INS1.org

Oncology Nursing Society ONS
ONS.org

APIC: The Association for Professionals in Infection Control
APIC.org

The Joint Commission
JointCommission.org

Center of Disease Control
CDC.gov

BD

# Considerations for vascular access device selection

## Infusion therapy process map

**Expected outcomes**

- Successful completion of prescribed therapy
- Minimize therapy-related complications
- Minimize the number of venipunctures
- Minimize supply and labor costs
- Patient satisfaction
- Reduced needlestick injuries and blood exposure to healthcare workers

## Patient considerations

**Diagnosis**

**Comorbidities**

**Visible/palpable vein**

**History of difficult access**

**Chronological age**

**Developmental age**

**Patient education and preference**

**Anatomical limitations/considerations**
- AV fistula/graft
- Limb amputation/injury/pathology
- Lymph node removal
- Head/neck trauma

**Care setting: insertion and dwell**
- Emergent
- Inpatient
- Outpatient/ambulatory
- Skilled nursing/long term acute care
- Home care

**Potential complications of insertion**
- Pneumothorax/hemothorax
- Malposition
- Arterial puncture
- Backwall puncture
- Hematoma
- Nerve injury
- Unsuccessful attempt/blown vein

**Potential complications of dwell**
- Infiltration/extravasation
- Insertion site infection
- Dislodgement/accidental removal
- Phlebitis/thrombophlebitis
- Thrombosis/DVT/stenosis
- Occlusion
- Bloodstream infections: CRBSI/PRBSI

## Therapy considerations

**Purpose**
- Life-sustaining
- Hazardous drug safety

**Duration**

**Infusates**
- pH
- Osmolarity
- Irritant/vesicant/cytotoxic
- Viscosity
- Volume
- Compatibility

**Blood sampling**

**Monitoring**

**Contrast-enhanced CT**

**Volume/flow rate**

## Provider considerations

**Care and maintenance**
- Insertion protocols
  - Maximum sterile barrier precautions
  - Standard precautions
  - Skin preparation
- Flushing and locking protocols
- Maintenance protocols
  - Needle-free connectors
  - Securement and stabilization
  - Dressing change procedures
  - Daily determination of line necessity

**Personnel**
- Knowledge of VAD selection
- Training on VAD placement procedure(s)
- Availability of placers

**Device cost**

**Procedure cost**
- Procedural success rates

## Device considerations

**Size**
- Diameter: French size/guage
- Length: centimeters/inches
- Port body: profile/diameter

**Number of lumens**

**Catheter material**

**Power injectable**

**Trimmable**

**Valved**

**Antimicrobial/antithrombogenic**

**Integrated extension**

**Safety features**
- Needlestick protection
- Blood control

## Placement venue and equipment

**Placement: point of service**
- Bedside
- Medical imaging
  - Diagnostic imaging
  - Interventional radiology
  - Cardiac catheterization lab
- Emergency department
- Specialty unit
- Surgical services
  - Pre-op
  - Anesthesia
  - Operating room
- Clinics, LTAC, non-acute facilities
- Medical transport

**Placement: equipment**
- Ultrasound and/or vein visualization technology
- Tip location/tip confirmation
- Needle guidance

# Noncytotoxic vesicant list

| Red list | Yellow list |
|---|---|
| Well-recognized vesicants with multiple citations and reports of tissue damage upon extravasation | Vesicants associated with fewer published reports of extravasation; published drug information and infusate characteristics indicate caution and potential for tissue damage |
| • Calcium chloride<br>• Calcium gluconate<br>• Contrast media–nonionic<br>• Dextrose concentration ≥ 12.5%<br>• Dobutamine<br>• Dopamine<br>• Epinephrine<br>• Norepinephrine<br>• Parenteral nutrition solutions exceeding 900 mOsm/L<br>• Phenylephrine<br>• Phenytoin<br>• Promethazine<br>• Sodium bicarbonate<br>• Sodium chloride ≥ 3%<br>• Vasopressin | • Acyclovir<br>• Amiodarone<br>• Arginine<br>• Dextrose concentration ≥ 10% to 12.5%<br>• Mannitol ≥ 20%<br>• Nafcillin<br>• Pentamidine<br>• Pentobarbital sodium<br>• Phenobarbital sodium<br>• Potassium ≥ 60 mEq/L<br>• Vancomycin hydrochloride |

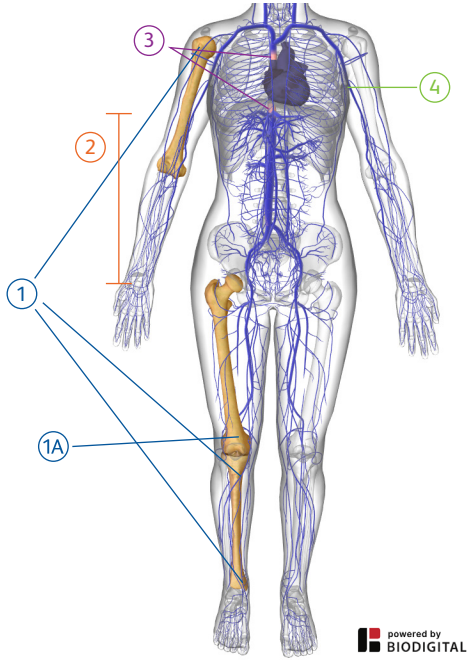
Infusion therapy is a complex clinical practice and varies greatly between individual patients and the therapies they receive. To safely infuse medications/solutions and minimize damage to the vasculature infusate, variables including pH, osmolarity, viscosity, dilution and volume should be considered, among other factors.

The first step in reducing the risk of extravasation is to identify and recognize medications and solutions that are associated with tissue damage when the solution escapes from the vascular pathway.

It is important to recognize that large infiltrations of nonvesicant medications or solutions may also be associated with severe tissue damage.

*Infusion Nursing Society, Noncytotoxic Vesicant List, 2016*

# Vascular Access Device Tip Termination




1 **Intraosseous:** Proximal Humerus, Proximal Tibia and Distal Tibia

1A Distal Femur (Pediatric only)

2 **PIVC:** range, hand up through upper arm

3 **Central:** CAJ both for SVC and the IVC

4 **Midline:** armpit/axillary crease

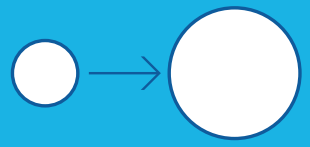
*Designation of VAD as central or peripheral is determined by final tip position*

# Poiseuille's Law:

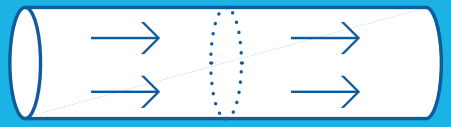
**The physics of flow through a tube**

Flow through a tube, including both catheters and blood vessels, is related to the following factors:

- Radius of the tube
- Pressure gradient across the tube
- Length of the tube
- Viscosity of fluid in the tube



Changes in radius have the greatest effect on flow rate (*r4*). Doubling the radius of a vessel lumen increases the flow rate by 16 times!



Similarly, hemodilution of medication/solution delivered intravenously is exponentially greater in central veins compared to peripheral veins.

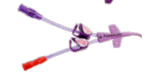
# BD® Peripheral Vascular Access Devices

| | Integrated extension | Blood control technology | Integrated wire | Power injectable | Diffusion tip technology | Integrated stabilization | Dual lumen | BD Vialon™ Biomaterial | Cue™ Needle-Tracking System | Seldinger technique / Modified technique | Early flashback indication |
|---|---|---|---|---|---|---|---|---|---|---|---|
|  BD Insyte™ Autoguard™ BC Pro Shielded IV Catheter with Blood Control Technology | | • | | • | | | | • | | | • |
|  BD Nexiva™ Closed IV Catheter System | • | • | | • | | • | | • | | | • |
|  BD Nexiva™ Diffusics™ Closed IV Catheter System | • | • | | • | • | • | | • | | | • |
|  AccuCath Ace™ Catheter | | • | • | • | | | | | | | • |
|  PowerGlide Pro™ Catheter | | • | • | • | | | | | • | | • |
|  PowerGlide Pro™ RT Catheter | | • | • | • | | | | | • | | • |
|  PowerGlide™ ST Catheter | | | | • | | | | | | • | |
|  PowerMidline™ Catheter | | | | • | | | • | | | • | |
|  Provena™ Midline Catheter | | | | • | | | • | | | • | |

# BD® Intraosseous Driver

| | Emergent access | Passive needle safety | Blood sampling | Ergonomic design | Manual Insertion | Driver with battery life indicator | Short dwell |
|---|---|---|---|---|---|---|---|
|  BD™ Intraosseous Powered Driver | • | • | • | • | • | • | • |
|  BD™ Intraosseous Manual Driver | • | • | • | • | • | | • |

# BD® Central Vascular Access Devices

| | Short dwell | Long dwell | Multi-lumen | Valved | Power injectable | Blood sampling | CVP monitoring | Cue™ Needle-Tracking System compatible | Sherlock™ TLS / Sherlock™ 3CG TCS compatible | Tunneled | Totally implanted |
|---|---|---|---|---|---|---|---|---|---|---|---|
|  PowerPICC™ Catheter | • | • | • | | • | • | • | | • | | |
|  PowerPICC™ SOLO™2 Catheter | • | • | • | • | • | • | • | | • | | |
|  PowerPICC™ Provena™ Catheter | • | • | • | | • | • | • | | • | | |
|  Groshong™ NXT PICC Catheter | • | • | • | • | | • | | | | | |
|  PowerGroshong™ PICC Catheter | • | • | | • | • | • | | | | | |
|  VeloCath™ Catheter | • | | | | • | • | | | | | |
|  PowerHohn™ CVC Catheter | • | • | • | | • | • | • | | | | |
|  PowerLine™ CVC Catheter | • | • | • | | • | • | • | | | • | |
|  Hickman™ / Leonard™ / Broviac™ CVC Catheter | • | • | • | | | • | • | | | • | |
|  PowerPort™ Implantable Ports | | • | • | | • | • | | | | | • |
|  PowerPort™ ClearVUE™ Implantable Ports | | • | • | | • | • | | | | | • |

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