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.

Selection of the most appropriate VAD occurs at the earliest opportunity and is a collaborative process among the healthcare team, the patient and the patients' caregiver. The least invasive VAD with the smallest outer diameter and fewest number of lumens needed for prescribed therapy is selected. Vessel health and preservation are prioritized when planning vascular access.

INS Standards of Practice 2021: 26.2, 26.3, 26.4, 26.5 page S74

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:

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

AVA: Association of Vascular Access
AVAinfo.org

Centers for Disease Control and Prevention
CDC.gov

CVAA: Canadian Vascular Access Association
CVAA.info

INS: Infusion Nurses Society
INS1.org

The Joint Commission
JointCommission.org

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

Skin integrity

Anatomical limitations or considerations
- AV fistula/Graft
- Limb amputation/injury/pathology
- Lymph node removal
- Head/Neck trauma

Care setting: insertion and dwell
- Emergent
- Inpatient
- Outpatient/Ambulatory
- Senior and long-term 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
- Catheter-related bloodstream infections

Therapy considerations

Purpose
- Life-sustaining
- Hazardous drug safety

Duration

Infusates
- pH
- Osmolarity
- Irritant/Vesicant/Cytotoxic
- Viscosity
- Volume
- Compatibility

Blood sampling

Hemodynamic monitoring

Contrast-enhanced CT

High volume/High flow rate

Provider considerations

Care and maintenance
- Institution 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

Patient preference

Size
- Diameter: French size gauge
- Length: centimeters/inches

Number of lumens

Catheter material

Diffusion tip

Power injectable

Trimmable

Valved

Antimicrobial/Antithrombogenic

Integrated extension

Safety features
- Needlestick protection
- Blood control

Fenestrated

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, retirement and long-term care 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 • Calcium gluconate • Contrast media–nonionic • Dextrose concentration ≥ 12.5% • Dobutamine • Dopamine • Epinephrine • Norepinephrine • Parenteral nutrition solutions exceeding 900 mOsm/L • Phenylephrine • Phenytoin • Promethazine • Sodium bicarbonate • Sodium chloride ≥ 3% • Vasopressin	• Acyclovir • Amiodarone • Arginine • Dextrose concentration ≥ 10% to 12.5% • Mannitol ≥ 20% • Nafcillin • Pentamidine • Pentobarbital sodium • Phenobarbital sodium • Potassium ≥ 60 mEq/L • Vancomycin hydrochloride

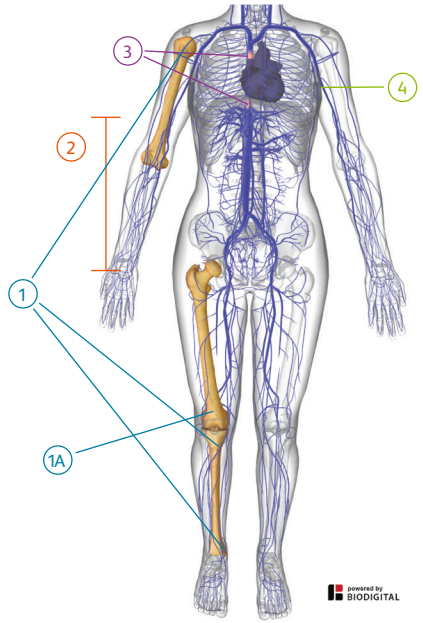
Infusion therapy is a complex clinical practice and varies greatly between individual patients and the therapies they receive. To safely infuse medications/solutions and minimize damage to the vasculature infusate, variables including pH, osmolarity, viscosity, dilution and volume should be considered,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

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

4 **Midline:** armpit/axillary crease

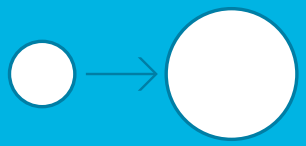
Designation of VAD as central or peripheral is determined by final tip position.

Poiseuille's Law:

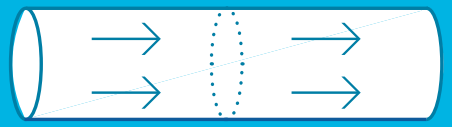
The physics of flow through a tube

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 catheter 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 Cathena™ Safety IV Catheter with BD Multiguard™ Technology		•		•				•			•
BD Nexiva™ Closed IV Catheter System	•	•		•		•		•			•
BD Nexiva™ Diffusics™ Closed IV Catheter System	•	•		•	•	•		•			•
AccuCath Ace™ Catheter		•	•	•							•
PowerGlide Pro™ RT Catheter		•	•	•					•		•
PowerMidline™ Catheter				•			•			•	
Provena™ Midline Catheter				•			•			•	

BD intraosseous drivers

	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	•	•	•	•		•					
PowerLine™ CVC Catheter	•	•	•		•	•	•			•	
Hickman™/Broviac™ CVC Catheter	•	•	•			•	•			•	
Power-Trialysis™ Short-Term Dialysis Catheter	•	•	•		•	•	•				
PowerPort™ Implantable Port		•	•		•	•					•
ClearVue™ MRI Compatible Port		•	•		•	•					•

Products listed may not all be available in Canada

BD–Canada, 2100 Derry Road West, Mississauga, ON L5N 0B3

bd.com/ca