Venous Access for PN

Vascular Access Devices

• Selection factors
  – Length of therapy
  – Type of therapy
  – Available patient anatomy
  – Osmolarity of solution
  – Patient preference
  – Patient activity and lifestyle
  – Consideration of coexisting devices

PN Venous Access

- Peripheral Access
  - Basilic, cephalic veins
  - Requires PN osmolarity ≤ 900 mOsm
  - Requires site placement change
  - Poor access sites common

- Central Access
  - Temporary
    - Subclavian or internal jugular most frequent
    - Femoral site

PN Venous Access

- Central access
  - Permanent
    - Tunneled
    - Sub cutaneous ports
    - Peripherally inserted central catheters (PICC)

- Catheter care
  - Care protocols essential for successful outcomes
    - Hand hygiene
    - Skin antisepsis
    - Site care and dressing regimens
## Vascular Access Devices

![Diagram of vascular access devices](image)

### Catheter Types

<table>
<thead>
<tr>
<th>Catheter Type</th>
<th>Access</th>
<th>Placement</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percutaneous non-tunneled central catheter</td>
<td>Central</td>
<td>Jugal, femoral, subclavian vessels</td>
<td>Economically, easily removable; can be replaced over guidewire, useful in acute care and short duration therapies</td>
<td>Catheter breakage; not repairable, patient self-care difficult; requires sutures to prevent dislodgement; high risk for catheter-related infections</td>
</tr>
<tr>
<td>Tunneled cuffed catheters</td>
<td>Central</td>
<td>Percutaneous placement via subclavian or jugular vessels or; cephalic, jugular vein cutdown</td>
<td>Long-term usage, home care, dressing and sutures can be removed after 1 month, self-care easy; repair kit available</td>
<td>Operating room or specialized room for placement, requires small procedure for removal</td>
</tr>
<tr>
<td>Peripherally inserted central catheter (PICC—tunneled)</td>
<td>Central</td>
<td>Percutaneous placement via a peripheral vein</td>
<td>Used in acute and home care for therapies ranging from several weeks to months, low risk of placement complications, placement occurs anywhere from radiology suite to patient bedside</td>
<td>Blood sampling not always feasible, self-care may be difficult with antecubital placement, extended home care, repair kits may not be available</td>
</tr>
<tr>
<td>Implanted ports</td>
<td>Central</td>
<td>Percutaneous venous placement via subclavian, jugular or peripheral vessels</td>
<td>Used for long-term therapies, site care only when accessed, monthly heparin flush, body image intact, no external segment for breakage</td>
<td>Needle access required, needle dislodgement can result in infiltration, placement in operating room or specialized room, surgical procedure for removal</td>
</tr>
</tbody>
</table>

# Catheter Types

<table>
<thead>
<tr>
<th>Catheter Type</th>
<th>Insertion Method</th>
<th>Use</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peripheral catheters</td>
<td>Peripheral</td>
<td>Least expense, least risk for catheter-related infections, no special placement room, clinicians are easily trained in placement</td>
<td>Require site rotation 48–72 h, not appropriate to infuse solutions 400–600 mosm/L, concentrated antibiotics, and vesicants</td>
</tr>
<tr>
<td>Midline catheters</td>
<td>Percutaneous insertion</td>
<td>Used for therapies lasting 2–4 weeks</td>
<td>Not appropriate for infusions requiring central access including PN</td>
</tr>
<tr>
<td>Midline catheters</td>
<td>Percutaneous insertion</td>
<td>Used for therapies 2–3 months</td>
<td>Not appropriate for infusions requiring central access including PN</td>
</tr>
</tbody>
</table>


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### Types of VADs – Peripherally inserted central catheter (PICC)

![PICC Diagram](http://www.fmnh.org/body.cfm?id=559)

![PICC Team](http://www.innovativenursing.org/PICC_Therapists)
Figure 46-9 Placement of peripherally inserted central catheter (PICC).

You and your physician have chosen a PICC for you to receive your total parenteral nutrition (TPN) and intravenous medications. Medications, fluids, and TPN can be administered directly into your bloodstream without having to frequently insert needles into your veins.

The PICC is an intravenous device that is placed near or above the bend in your arm. It is made of a soft flexible material that should feel comfortable with movement and allow you to use your arm normally. A PICC is placed at the bedside by specially trained nurses or in the Interventional Radiology Department. It is inserted so that the tip of the catheter sits in the large vein above the heart (the superior vena cava). With proper care, your PICC can last several weeks to months.

You and your caregiver will be instructed on how to care for your PICC. Arrangements will be made for your teaching to take place in the hospital by a Nutrition Support Nurse or at home by a home care nurse.
Types of VADs – Broviac/Hickman

Hickman / Broviac Catheter
Types of VADs - Port

Indwelling Port
## Catheter vs Port

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Tunneled external catheters</th>
<th>Subcutaneous implanted ports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lumen</td>
<td>Single, double, triple</td>
<td>Single, dual</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Daily, requires patient training</td>
<td>Monthly, no training required</td>
</tr>
<tr>
<td>Activity</td>
<td>Some restrictions (swimming)</td>
<td>No restrictions</td>
</tr>
<tr>
<td>Blood draw</td>
<td>Very reliable</td>
<td>Moderately reliable</td>
</tr>
<tr>
<td>Cost</td>
<td>Higher maintenance cost</td>
<td>Higher initial cost</td>
</tr>
<tr>
<td>Access</td>
<td>External</td>
<td>Percutaneous Huber needle</td>
</tr>
<tr>
<td>Flow</td>
<td>Determined by lumen diameter</td>
<td>Determined by needle gauge</td>
</tr>
<tr>
<td>Complication rate</td>
<td>Higher</td>
<td>Lower</td>
</tr>
<tr>
<td>Removal</td>
<td>In the office or at the bedside</td>
<td>May require second surgical procedure</td>
</tr>
</tbody>
</table>
Complications

Infusion Phlebitis

Infiltration

Extravasation

Checking CVL Placement

Right

Cavo-Atrial Junction
SVC
Checking CVL Placement
Checking CVL Placement

Differences in Neonates

• Central access can also include
  – Umbilical vein
  – Umbilical artery

• Special rules
  – Either can be used for nutrition
    • Keep artery more at peripheral levels
  – If classified as “low-lying,” do not use
  – No lipids in umbilical artery
  – Be cautious of labs if drawn through same line as PN
Fetal Circulation

http://nursingcrib.com/nursing-notes-reviewer/fetal-circulation

Fetal Circulation

http://easypediatrics.com/umbilical-vein-catheterization
Differences in Neonates

• Often put heparin in all central lines
  – 0.25 unit/mL – 2 unit/mL
• Except higher osmolarities peripherally
  – Typically between 1000-1200 mOsm/L is okay
• Some institutions will run PN through both lines
  – Be careful about ordering totals for these situations