Vascular Access

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Objectives

• Participants will be able to list the considerations when selecting appropriate vascular access for the prescribed therapy.

• Participants will be able to identify the selection criteria involved in choosing the appropriate vascular access to meet patient specific needs.

• Participants will be able to list several complications related to vascular access.
Indications for IV Therapy

- Can it be given in a less invasive method?
- Lasix 20 mg PO vs IV
- Be sure there is not another viable equally effective option.
- By mouth, suppository, inhalant, injection (many drugs have the same blood concentration regardless of administration method, some do not)
Indications for IV Therapy

- TPN, PPN, Fluids, Electrolytes
- Anesthetics substances
- Diagnostic substances
- Pain Medications
- Antineoplastic therapy.
- Blood and/or blood component therapy.
- Anti-infectives (Antibiotics, antivirals, antifungals, etc)
- Anti-emetics
- Anti-seizure medications
- Cardiac, respiratory and other system specific medications
- This list can become endless
Indications for IV Therapy

- To establish or maintain fluid and electrolyte balance.
- To administer medication, continuous, intermittent or bolus
- Hemodynamic monitoring of central venous circulation
- To maintain or correct a patient’s nutritional state
Considerations in Selection of Vascular Access Device

- Patient’s medical history
- Patient’s age, size, general condition
- Condition of patient’s veins
- Type and rate of I.V. fluid or medication to be infused
- Expected duration of I.V. therapy
- Will patient be DC with IV and if yes to where
- Patients Dominant side
Considerations in Selection of Vascular Access Device

- Medical History – allergies, mastectomy, dialysis
- Caregiver
- What type of job does the patient do, hobbies – horseback riding, car racing, gardening, etc
- The goal is to find out what might affect the patients care and IV needs for the entire course of treatment not just “today”
- The more you know – the better you can meet the needs of the patient, physician, drug, nurse/caregiver
You want Vascular Access for who?
Pediatric catheter insertion sites

- Temporal
- Posterior auricular
- Jugular
- Basilic
- Subclavian
- Cephalic
- Brachial
- Superior vena cava (tip location)
- Inferior vena cava (alternate tip location)
- Femoral
- Umbilical Vein (for first week of life)

Types of IV Therapy

1. Peripheral IV Therapy
   • Short ¾ to 1 ½ “
   • Midlines

2. Central Venous IV Therapy
   • Tunneled IV Catheters
   • Non Tunneled IV Catheters
   • Ports
   • PICC – Peripherally Inserted Central Catheters

3. Interosseous Infusion Therapy
   • Into the bone
Peripheral IV Therapy – arms, hands, in infants scalp and feet
  – For short term (1-14 day therapy)
  – Limits
    • Above 10% Dextrose must be give via central line
    • Repeated venipunctures may be needed to maintain IV access.
    • Infiltration, phlebitis or catheter obstruction can interrupt therapy.
    • Types of medications that can be given are limited
    • Some drugs must go central ex TPN
    • Limits to catheter dwell time limits rotate sites every 3 days
– Limits Continued

• Because of the risk for vein irritation and damage, the Infusion Nurses Society (2011) Standards provide guidance for therapies that are not appropriate for peripheral administration including
  * Continuous vesicant drug infusions
  * Parenteral nutrition
  * Infusates with a pH lower than 5 or higher than 9 or an osmolality greater than 600 mOsm/L.
– Benefits

• Fast Access
• Good for all ages
• Good for intermittent infusion
• Excellent in emergency where quick access is needed
• Nurses, Paramedics, Techs can start
Midline

• For short term therapy – peripheral
  – For short term generally 4 weeks
  – Limits – same as Peripheral catheters
    • It is places in the same place as a PICC line but it ends prior to the axilla so it is a peripheral IV
    • Can not draw labs from Midline
  – Benefits
    • Good for all ages
    • Good for intermittent infusions
    • Lasts a little longer than traditional peripheral IV so less restart
Types of IV Therapy

Central Lines

• For long term therapy (7 days to lifetime)
• Located in the central vasculature
• Benefits:
  – Any drug that can be given IV can go in central line
  – Long term can they stay in for years

• Other considerations
  – Surgical procedure for some
  – It is a potential entry portal for infection

• Names of Central IVs are by:
  – Location
  – Name of the particular catheter
  – Name of the inventor of the catheter or insertion technique
PICC – Peripheral Inserted Central Catheter

- It can be placed by a PICC Certified Nurse or a physician
- They can last for years, some recommend if therapy to be more than one year use tunneled catheter or port
- All IV medications can be given in it
- Can be single or double lumen
PICC – Peripheral Inserted Central Catheter
Non-Valved

All Central Catheters can be single or double lumen
PICC – Peripheral Inserted Central Catheter

Valved PICCS

- Have no clamps.
- Have a valve that prevents blood reflux into the catheter.
- Do not require heparin for flushing.
- Are saline-only lines
- Groshong, PASV and Power PICC Solo
PICC – Peripheral Inserted Central Catheter

Can increase patients mobility which can be good or bad!
Tunneled Central Venous Catheter

Tunneled Central Venous Catheters:
- Single, double or triple lumen device, surgically tunneled through subcutaneous tissue to an exit site generally on the chest or abdominal wall.
- The tip rests in the vena cava.
- A cuff that lies in the subcutaneous tunnel, around which fibrous tissue grows, helps to secure the device.

Types of IV Therapy - Central Lines
Tunneled Central Venous Catheter

- Entry site: On the upper chest.
  - The site where the catheter enters the SVC.
  - Heals soon after the insertion.
- Exit site: 3rd to 4th intercostal space
  - Where the catheter exits the tunnel.
  - The dressing site.

Can be hidden under clothing which is good for body image
Tunneled Central Venous Catheter

Tunneled Central lines
• Long-term catheters
• OK for blood draws & any kind of IV Therapy
• Tunneled under the skin to decrease infection and accidental removal.
• In home care have had patients cut with scissors
• Pt/CG learns site care, cap change and flushing.
PASV Tunneled Central Venous Catheter

- PASV - Pressure Activated Safety Valve (PASV can be on a PICC, tunneled or non-tunneled line)
- Three-way valve in external hub of catheter
- Saline or heparin
- Pulsatile (start/stop) technique when flushing
- Once weekly flushing when not in use
- No clamps

Cuff to secure the device

Types of IV Therapy - Central Lines
Groshong Tunneled Central Venous Catheter

- Groshong Catheter
- Have no clamps.
- Have a valve that prevents blood reflux into the catheter.
- Do not require heparin for flushing. (Excellent choice for patients with Heparin allergy.)
- Are saline-only lines
- Weekly flushing when not in use excellent when limited Caregiver

Groshong Catheter Newly Inserted

Inventor was Dr. LeRoy E. Groshong a surgical oncologist in 1978
Small Bore Tunneled Central Venous Catheter

*Tunneled small-bore catheters*, which are often referred to as Hohn, Hickman, or Broviac catheters,

- Hohn, Hickman and Broviac Catheters – is placed in the chest
- The Bard Purple catheters indicate they are power injectable (can be used by radiology for dye studies and scans under pressure)
- Just because it is purple does not make it a PICC (remember a PICC by definition is in the arm).
- Frequently used for infusion of antibiotics or other medications, nutritional supplements, and chemotherapy treatments.
- These catheters may have retention cuffs to reduce infection risk and prevent accidental removal
- Some of our tunneled small-bore catheters can be used with a power injector for a CT scan or MRI, avoiding a separate intravenous catheter placement.
Tunneled Central Venous Catheter

- Insertion site
- Exit site

**Hickman**

Generally used in adults
Named for inventor
Dr. Robert O. Hickman a Pediatric Nephrologist

**Broviac**

Generally used in children
Named for inventor
Dr. John W. Broviac a Nephrologist
Non-Tunneled Central Venous Catheter

Non-Tunneled small-bore catheters are for short term use 5-10 days, rotate at 21 days. Generally sutured for duration.

- Central venous access for infusion of vasoactive drugs, TPN, high dose KCl, etc.
- Hemorrhagic disorder where large volumes blood/blood products needed
- Measurement of central venous pressure
- Need for frequent blood draws where peripheral access limited.
- Lack of peripheral venous access
- Ease of bedside emergent insertion
Non- Tunneled Central Venous Catheter

Jan’s Least Favorite
- Dirty location
- Increase Infection
- Easy to pull/fall out
- Least comfortable for patients and staff

Types of IV Therapy - Central Lines

Femoral Catheter

IJ Catheter – Internal Jugular
Types of IV Therapy - Central Lines

Ports Central Venous Catheter
Ports Central Venous Catheter

Types of IV Therapy - Central Lines

- Entrance Site
- Port Tunnel
- Port Pouch (Pocket)
Types of IV Therapy - Central Lines

Ports Central Venous Catheter

Implanted Ports

- Limits:
  - Requires a minor surgical procedure for placement and removal.
  - Medication delivery requires injection through skin
  - Can get a port pocket, tunnel, or sepsis infection
Ports Central Venous Catheter

- Advantages of implanted ports:
  - They are cosmetically appealing and preserve body image
  - Lowest risk of infection of all chest-accessed central lines
  - Allow patients to carry on virtually all activities including bathing and swimming when it is not in use
  - Ports do not require exit-site care, when not accessed
  - Weekly needle change and daily flush when in use
  - Monthly access and flush not in use
  - Generally used in adults
  - Seen primarily in Oncology patients
Dialysis Catheters

- Have venous and arterial sides
- Dialysis Catheter used should be reserved to Dialysis staff
- Can be used with special training to give other medication in other areas if absolutely necessary
- Be mindful of not using arms as if the dialysis continues the patient will need arms for a shunt
Intraosseous Access

- Intraosseous Access requires special training
- It is most commonly seen in ER and battlefield situations
- Can be used with special training to give other medication in other areas if absolutely necessary
Consider this when choosing IV Access:

- **Urgency of Therapy:**
  - In ICU and ER the “urgency” takes precedence. Get the emergent drugs in and then when the patient is stable change the access later
  - Sometimes this can lead to an infection if proper care is not taken to clean sites prior to starting IV so these lines are often changed
- **Medication:**
  - Does it have to be given in central catheter like TPN
- **Length of IV Therapy** – one dose, weekly, monthly, lifetime
- **Nurse or Pt/cg learns to self-infuse** – will it be completed at the hospital or will it be given at home or SNF
Age of the Patient:

• Neonatal, Infants and toddlers IV needs:
  • Neonatal IV Needs:
    – Congenital cardiac disorders
    – GI defects
    – Neurological Defects
    – Birth Defects
  • Infants IV Needs:
    – Dehydration (FVD) – makes peripheral difficult
    – Diarrhea (Fluid and Electrolyte Imbalances)
    – Antibiotic Therapy
    – Nutritional Support
    – Antineoplastic Therapy
Infants and Children

• In infants you have some additional IV sites
  – The scalp veins
  – Legs and feet
  – Umbilical Vein for the first week of life

• Some additional considerations
  – Must use volume control chambers with no more than 500 ml preferably 250 ml
  – Plastic fluid containers
  – Microdrip tubing prevents overdosing
  – Restraints will be needed – which we do not want to use
This is the reality of a child in ICU with IV Therapy
Age of the Patient - Children

- Children – never bribe or threaten as illness is often perceived as “being bad”
- Sometimes there is a fear of death with invasive procedures as well as fear of mutilation of their body
- Children want to run, play and hop. The IV needs to give them the ability to play while protecting the IV
  - This may involve splinting limbs which must be protected to cause damage from the splinting
- When caring for children you also have a parent to care for
Age of the Patient - Teens

- Body Image is a consideration
- Social Media will tell their story
Age of the Patient - Teens

- Underlying Issues for Teens needing IV Access
- Anorexia, Bulimia, Body Image Issues
- Cancer
- Accidents
  - Trauma
  - Infection
- Drug Abuse
Age of the Patient - Adults

- To provide parenteral nutrition
- To provide avenue for dialysis/apheresis
- To transfuse blood products
- To provide avenue for hemodynamic monitoring
- To provide avenue for diagnostic testing
- To administer fluids and medications with the ability to rapidly/accurately change blood concentration levels by either continuous, intermittent or IV push method.
Age of the Patient - Elderly

- The elderly are at high risk for circulatory overload, making close monitoring essential. Signs and symptoms include:
  - Elevated blood pressure
  - Rapid respirations
  - Coughing and shortness of breath
  - Signs and symptoms of pulmonary edema
Age of the Patient - Elderly

- Fragile veins may cause infiltration immediately upon catheter insertion.
- Skin becomes paper-thin in the elderly.
- Immobilize the catheter well to prevent movement, which may cause skin tears.
- Stabilize the vein well, as veins in the elderly have a tendency to roll upon insertion.
- Dehydration, vascular disease, and obesity may limit available sites for intravenous access.
- Initiate therapy as low on the vein as possible so that sites above it may be used if necessary.
Complications related to IV Therapy

Phlebitis:

- Chemical - Infusate chemically erodes internal layers.
- Mechanical - Caused by irritation to internal lumen of vein during insertion of vascular access device and usually appears shortly after insertion.
- Bacterial - Caused by introduction of bacteria into the vein.
- Remove the device immediately and treat w/antibiotics.
Complications related to IV Therapy

Cellulitis:

- Caused by poor insertion technique
- Inflammation of loose connective tissue around insertion site.
- Red swollen area spreads from insertion site outwardly in a diffuse circular pattern
- Treated w/antibiotics
Complications related to IV Therapy

Infiltration:

- Caused by IV not being in the vein securely. Fluid leaks into the surrounding tissue. (note arm band)
Complications related to IV Therapy

Extravasation:

- When the fluid that leaks out vein is of a vesicant nature – chemo, or other corrosive medication.
Complications related to IV Therapy

Septicemia/Pulmonary Edema/ Embolism:

Septicemia:
- Severe infection that occurs to a system or entire body
- Most often caused by poor insertion technique or poor site care
- Discontinue device immediately, culture and treat appropriately

Pulmonary Edema: - Can be caused by rapid infusion

Pulmonary embolism: - Caused by any free floating substances that require thrombolytic therapy for several months. Increased risk w/lower ext.

Air embolism: - Caused by air injected into IV system. Can be from clamp open and cap off.
Reference List

- Ankenmann, Janice RN MSN CCRN FNP-C; Napa Valley College, Health Occupations, NURS 372, Intravenous Certification
  


The End

Questions??