CHILDREN SUPPORTED BY MEDICAL TECHNOLOGY IN SCHOOLS: CARE AND MAINTENANCE OF CENTRAL VENOUS LINES

Lauren E.B. Stone, MSN, RN, VA-BC
Nurse Manager IV Team and Blood Donor Center
Boston Children's Hospital

FINANCIAL DISCLOSURES

Disclosure of Relevant Financial Relationships
I have no financial relationships to disclose.

Disclosure of Off-Label and/or investigative uses
I will not discuss off label use and/or investigational use in my presentation.
OBJECTIVES

• The learner will be able to describe principles of basic care of Peripherally inserted central catheter (PICC) and central venous catheter (CVL)
  • Site assessment
  • Dressing change practices
• The learner will be able to state appropriate interventions and maintenance of central venous catheters
  • Appropriate interventions for complications
  • Emergent catheter issues

OUTLINE

• Vascular Anatomy
• IHCP and Developmental stages
• Line Types
  • Reasons for selecting
• Line care
  • Flushing and dressing changes
• Complications
  • Infiltration, phlebitis, infection, occlusion, skin allergy
  • Emergent issues: bleeding, catheter fracture, air embolism
INDIVIDUALIZED HEALTH CARE PLAN

- Specific to student’s age, developmental stage and clinical care needs
- Medical conditions and allergies
- Type of vascular access device
- Conditions to report to family/provider
- Steps to be taken if complications occur
  - Emergent and non-emergent
- Supplies/prescribed medications (flushes)
- Activity restrictions (based on type of device)
Developmental Stages

Developmental Stage | Characteristics
--- | ---
Neonate | Self-centered. Develops trust as needs are met. Unpredictable response to repeated procedures.
Infant | Begins to separate self from others. Recognizes primary care takers & responds with fear of change.
Pre-school | Exhibits general interest. Early separation anxiety. Pre-schoolers have more abstract thinking. Increased self-control. Fear of body mutilation.
School-Age | Begins to separate self from others. Mistrust develops as needs not consistently met. Recognizes primary care takers & responds with fear of change.

CVC Care Interventions

- Peripherally Inserted Central Catheters (PICCs)
- Implanted Ports
- Tunneled Catheters
- Power – injectable Catheters
- Specialty use Devices
  - Hemodialysis
  - Apheresis


CENTRAL VENOUS ACCESS CATHETERS

- Peripherally Inserted Central Catheters (PICCs)
- Implanted Ports
- Tunneled Catheters
- Power – injectable Catheters
- Specialty use Devices
  - Hemodialysis
  - Apheresis
CENTRAL VENOUS ACCESS

- Peripherally Inserted Central Catheters (PICCs)
  - Devices placed for access into Superior Vena Cava
  - Allows for infusion of highly concentrated medications and vein irritants
  - Several weeks to months of therapy
    - No limitation in dwell time per INS
  - Inserted via antecubital fossa or in upper forearm
  - Length customized to patient’s anatomy
DOUBLE LUMEN CATHETER TIP

Figure 46-9 Placement of peripherally inserted central catheter (PICC).
SURGICALLY IMPLANTED DEVICE

• Implanted Port/Disc
  (aka: “Port-A-Cath, Venous Access Disc”)

• Tunneled Catheters
  (aka: “Hickman” or “Broviac” Catheters)

• Specialty Catheters
  • Hemodialysis
  • Apheresis

IMPLANTED PORTS

- Single Lumen
  - Titanium Body

- Double Lumen
  - Plastic Body
IMPLANTED PORTS


Venous Access Port

Vein Entry
Port
End of Catheter
SURGICALLY IMPLANTED DEVICES

• “Tunneled Catheter” (aka: “Hickman” or “Broviac”)
  • Considered “permanent” device for long term central access therapy
  • Surgically placed by MD
    • Generally located near subclavian area of chest but can also be placed lower (even near abdomen)
  • Catheter has “cuff” near exit site that allows for epithelial growth that eventually holds catheter in place
  • Single or double lumen devices
SPECIALTY DEVICES

- Apheresis and Dialysis Catheters
  - Surgically placed “permanent” devices with large internal lumens
  - Generally located in neck or upper chest
  - Used **ONLY** for Apheresis or Dialysis access by nurses in these specialty areas
    - Kept patent with 1000u/cc or 5000u/cc heparin solution
    - **CAUTION**: Attempting to infuse via these devices can compromise patient’s access for Apheresis and Dialysis and can cause anticoagulation with a heparin bolus
APHERESIS AND DIALYSIS CATHETERS

CENTRAL LINE COMPLICATIONS

- Infection
- Migration
- Occlusion
- Phlebitis
- Infiltration
- Skin Allergy
- Emergent Issues
INFECTION

• Prevention: hand washing, aseptic technique
• Gloves, Masks
• Assessment
• Skin integrity
• Moisture and temperature- bacterial growth

PREVENTION

I - Implement Insertion, Care, and Maintenance Bundles
S - Scrupulous Hand Hygiene
A - Always Disinfect Every Needleless Connector
V - Vein Preservation
E - Ensure Patency

• Cleanse access site thoroughly before EACH access
• Use devices for accessing tubing/catheter hub ONCE
• Cap all tubing sets between uses and keep clean
• Follow policies for changing tubing at appropriate intervals

http://www.avainfo.org
INFECTION

- Causes
  - Compromise in site dressing or non-antiseptic hub and IV tubing manipulation allowing bacterial infiltration

- Symptoms
  - Pain
  - Exudate
  - Redness around insertion site
  - Elevated temperature, WBC with no other source

- Interventions
  - Notify Provider/family
  - Often requires removal of catheter

MIGRATION

- Causes
  - Inadvertent dislodgement
  - Catheter movement with dressing changes

- Symptoms
  - External catheter present
  - Increase in amount of external catheter present

- Interventions
  - Notify Provider/family
DRESSING CHANGES

- Aseptic technique
- Sterile field
- Mask, Gloves, 4x4 gauze, CVL dressing kit
- Stabilize to prevent line migration

CATHETER SECUREMENT

PICC secured with *subcutaneous device, CHG disc* and bordered transparent dressing

PICC secured with *adhesive device and transparent dressing*
Nursing Indications

- ALWAYS check for vigorous blood return before flushing/infusing via catheters
  - SVC blood flow is approx. 2 liters/minute
  - Should have “free-flowing” blood return, WITHOUT resistance
- Check for “sluggishness” with flushing
- Partial vs. Complete Occlusion
IMPAIRED CATHETER FLOW

• Nursing Indications
  • Check first for mechanical causes
    • Clamps
    • External Kink
    • Reposition patient
  • Consider recent line care
    • When last flushed
    • Flushing immediately at end of infusion

OCCLUSION

• Inability to flush or aspirate blood from catheter
  • Causes
    • precipitates, blood back up, thrombus, fibrin sheath, catheter kinking, catheter malposition
  • Interventions
    • dressing, cap change
    • Further evaluation by provider
  • Prevention:
    • Flushing SASH
    • Positive pressure
PHLEBITIS

- Causes
  - Mechanical or Chemical irritation of vein wall
  - Catheter size
  - Infusate

- Symptoms
  - Pain, tenderness, redness, edema at or above insertion site, “palpable cord”

- Interventions
  - Heat – warm pack
  - Further evaluation by provider
  - LISTEN to your patient! Pain means problem!
INfiltration

• Causes
  • Cannula displacement from vein or leakage of infusate around cannula hub into surrounding tissue

• Symptoms
  • Swelling
  • Cool to palpation
    (IV fluid is room temperature-cooler than body temperature)
  • May still obtain blood return on aspiration
INfiltration

• Prevention
  • Assess site prior to infusion
    • Visual inspection
    • Tactile inspection
    • Flush catheter and check blood return
  • Monitor infusion

• Interventions
  • Stop infusion
  • Further evaluation by provider
SKIN ALLERGY

- **Causes**
  - Allergic response to skin prep or dressing materials

- **Symptoms**
  - Rash, redness around site,

- **Interventions**
  - Allow all skin prep solutions to thoroughly dry before applying dsg.
  - Further evaluation by provider

Patient with allergic reaction to dressing materials

---

EMERGENT ISSUES

- Development of a fever, redness at the CVC site, drainage, increased fatigue, irritability, or headache (potential S&S infection)
- Catheter cap is missing
- Catheter pulled or falls out
- Catheter fracture
- Child complains of chest pain or shortness of breath

Don't Panic!

---

PREPARED

---
INFECTION

- Development of a fever, redness at the CVC site, drainage, increased fatigue, irritability, or headache
- Notify provider/family

MISSING CAP

- Clamp catheter
- Keep protected and as clean as possible
- Scrub the hub
  - Cleanse with alcohol prep
- Replace cap
- Notify provider/family
CATHETER IS PULLED

Stay calm – Reassure the student

- Cover the CVC exit site with sterile gauze if immediately available or a clean dressing; applying gentle pressure to the site.
- Inspect the exterior of the dressing. If the dressing is intact and the tape still holds the looped catheter, it is probable that no significant trauma to the child or the line has occurred.
- If the tape or dressing has been disrupted, it should be taken off and the exit site inspected. A new dressing should be applied if there is no evidence of bleeding or trauma at the exit site.

CATHETER FALLS OUT

Stay calm – Reassure the student

- If the catheter has fallen completely out, apply firm pressure to the exit site with sterile gauze if immediately available or a clean dressing.
- Save catheter for inspection
  - Measure length to identify that entire catheter has been removed
- Notify the physician and family immediately
IMPLANTED PORT NEEDLE FALLS OUT

Stay calm – Reassure the student

- Inspect the insertion site for bleeding/trauma
- Apply gauze if bleeding or oozing noted at site
- Handle/dispose of needle carefully, according to school sharps safety policy
- Notify the family and/or physician

CATHETER FRACTURE

Stay calm – Reassure the student

- Clamp the catheter as close to the child’s body as possible above the break.
- Wrap the broken end with sterile gauze.
- Notify the family and physician immediately.
CHEST PAIN/SHORTNESS OF BREATH

Stay calm – Reassure the student

• Position the student lying down on his/her left side
  This helps prevent an air bubble from entering the heart
• Transport the child to the school nurse’s office via wheelchair
  Do not let the student walk
• The student should be transported as soon as possible to the
  appropriate emergency room
• Notify family and physician immediately

NURSING CARE PLAN

• Catheter assessment
  • “Quality” of flow when flushing/infusing
  • Use “pulsating” or “positive pressure” technique when
    flushing and clamp all devices (if required) when not in use
    to prevent backflow of blood and clotting
  • Integrity of device
NURSING CARE PLAN

• Site assessment
  • With every access/flush of the device
  • Dressing integrity
  • Look for redness, swelling, exudate, discomfort i.e.: pain or burning
  • Palpate for temperature changes at or above site
• Complications should be treated appropriately as soon as possible
  • Time delay in treatment can affect outcomes

RESOURCES

• Individual Health Care Plans
• Organizational Guidelines
• Orders/treatment plans from Providers and referring agencies

Supporting Students with Special Health Care Needs Guidelines and Procedures for Schools, Third Edition
Editors: Stephanie M. Porter M.S.N., RN, Patricia A. Branowicki MS, RN, NEA-BC, FAAN, and Judith S. Palfrey M.D.
Thank you!