

PICC and Umbilical Catheter Safety in Neonatal Patients





PICC and Umbilical Catheter Safety for Neonatal Patients

co-presented by:

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- Welcome and Overview
- Care, maintenance, and complications with PICC therapy in neonatal patients
- PICC Catheter Safety Considerations in Neonates
- Care, maintenance, and complications with Umbilical Catheter therapy in neonates
- Umbilical Catheter Safety Considerations in Neonates
- Umbilical Catheter Case Studies
- PICC Case Studies

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One contact hour of nursing continuing education credit is available

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- To describe indications for use, placement considerations and catheter care for peripherally inserted central venous catheters (PICCs) and umbilical catheters in neonatal patients
- To recognize complications associated with PICC and umbilical catheter use in neonates
- To identify safety tips and risk reduction strategies that promote neonatal patient safety with PICCs and umbilical catheters



Peripherally Inserted Central Catheters (PICCs)

Used in neonates/infants since introduction more than 3 decades ago to administer:

- Hyperosmolar solutions
- Medications
- Continuous infusions

Not recommended for:

- Blood products
- Bolus medications with a continuous drip

- Determine infusion needs and length of therapy
 - Review current laboratory data (blood cultures, bleeding times)
 - Any sensitivities to tape or antiseptics
 - History of central catheter placement



- Obtain physician/NNP order
- Verify Informed Consent
- Time Out

Consider the following:

- Infant's overall medical condition
- Anticipated length of treatment
- Assess need for vascular access device early (decrease sites used for multiple IVs, pain, etc.)
- Condition of peripheral veins

- Position and swaddle (if able)
- Sucrose pacifiers
- Pain meds
- Safe application of warm packs can promote vasodilatation
- Cover the patient's eyes if bright lights are use

Identify veins for catheter insertion

- Basilic
- Cephalic
- Saphenous
- Temporal
- Other



- 24 to 28 gauge PICCs most commonly placed in neonates
- Smaller catheters don't allow for routine blood sampling or transfusion
- Select the smallest catheter that will meet your needs

PICC Preparation Insertion Site

- Prep the insertion site with an antimicrobial agent (povidone iodine or Chlorhexidine)
- Follow manufacturer indications and instructions when applying antiseptic agents

Insertion difficulties include:

- Vein cannulation problems
- Advancing the catheter to pre-measured distance
- Tip malposition

Once venous access is obtained, advance the catheter slowly to prevent vascular irritation, phlebitis

- Should advance easily– don't force
- Difficulty in advancing catheter can result from valves, bifurcation, venospasm, or the cannula isn't inside the vein
- Flushing the catheter may help advance the catheter past obstructions

- Once catheter has advanced, withdraw needle until it is outside the skin
 - Peel the cannula away according to manufacturer's instructions
- Advance catheter to desired position

- No blood return on smaller gauge catheters
- Secure the catheter, apply sterile dressing
- Verify the location of the catheter tip with x-ray

Insertion complications may include:

- Infection
- Bleeding/Clotting
- Arterial cannulation
- Arterial perforation
- Arrhythmia
- Hemothorax
- Pneumothorax

- Prepare all devices prior to procedure
 - Catheter
 - Introducer Needle
 - Guide wire
- Maximum sterile barrier precautions (face mask, cap, sterile gown and gloves)
- Large sterile field to prevent contamination on peripheral surfaces



- Follow the manufacturer's recommendations
 - Avoid force, both with needle insertions and advancing your catheter

- Make sure hemostasis is achieved prior to placing the dressing
- Replace dressing prn or per hospital policy

- Indication for the procedure
- Verification of informed consent
- Time out
- Analgesics, sedatives or local anesthetic given
- Date and time of placement, name of person placing the catheter
- Vein selected

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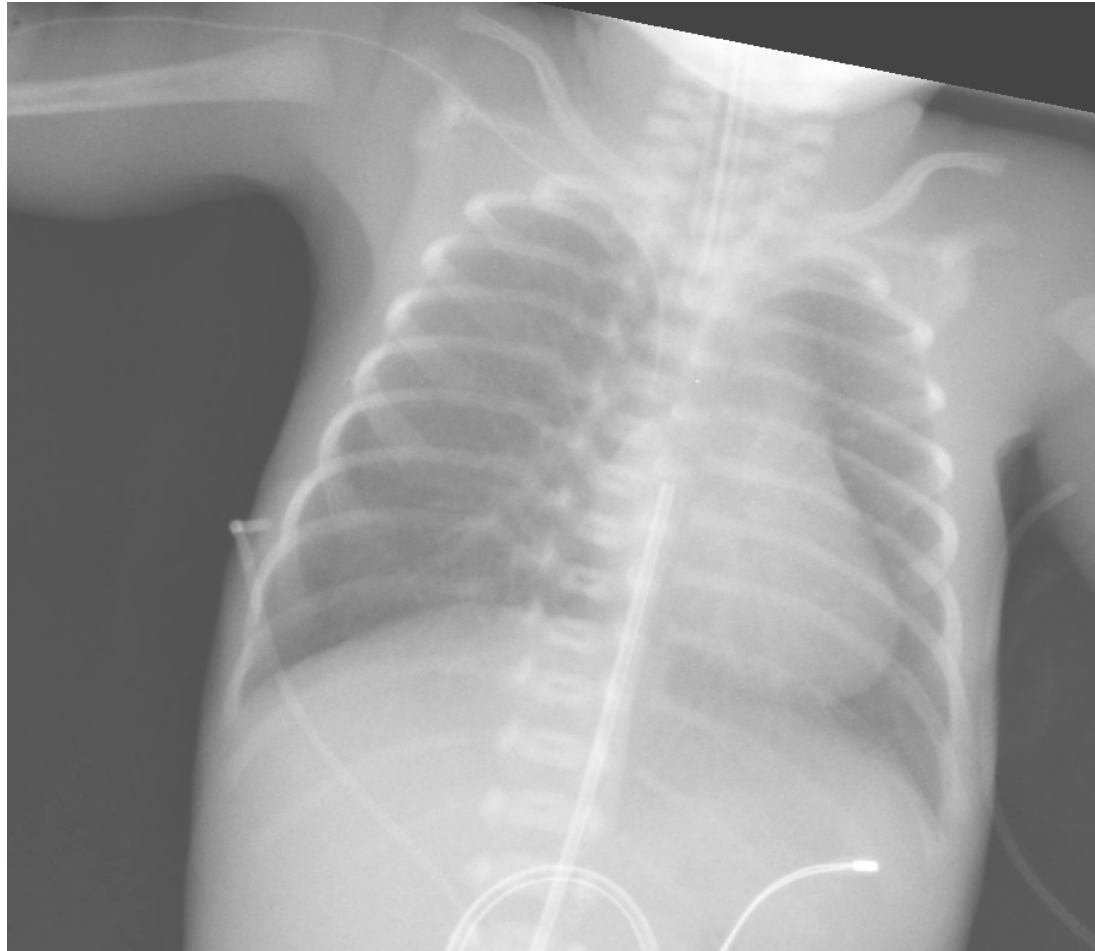
- Number of attempts, use of transillumination or ultrasound, amount of blood loss
- Skin prep and type of dressing/securement device
- Infant's tolerance of procedure, complications and actions taken to address them
- Catheter length/Insertion distance
- Dressing changes

Catheter

| | |
|--------------------------|-------------------------|
| Brand name | Model number |
| Size, number of lumens | Lot number |
| Original catheter length | Trimmed catheter length |

Introducer

| | |
|--------------|--------------|
| Type (style) | Model number |
| Brand name | Lot number |
| Size | Length |



- Malposition/migration
- Catheter occlusion, thrombosis or mechanical phlebitis (treat per hospital policy)
- Catheter leakage, with external or internal fracture
- Catheter dislodgment
- Catheter-related local or systemic infection
- Dermatitis
- Infiltration

Consider catheter exchange or removal in the following situations:

- Damaged catheter
- Change in type or size of device needed
- Occlusion
- Malposition
- Dislodgement

- Stop IV fluid
- Remove dressing; clean exit site; slowly withdraw catheter
- Hold pressure for 5 minutes
- Place dressing if needed
- Observe area for 1 hour for bleeding or hematoma
- Inspect catheter



Umbilical Catheters

Early use

- 1947 - exchange transfusion for severe indirect hyper-bilirubinemia
- 1959 for blood gas determination

Current use

- Rapid and reliable vascular access
- Accurate laboratory determination, invasive monitoring
- Administration of fluids, medications, parenteral nutrition, and blood products

UAC (umbilical arterial catheter)

- Monitoring blood gases
- Should not be used for: blood products, pressors, calcium boluses, and sodium bicarbonate

UVC (umbilical venous catheter)

- Pressors and hypertonic solutions
- Low venous lines also used for emergency access and exchange transfusions
- Should not be used for platelets

Most often made of polyvinylchloride

- Silastic, bonded, and newer plastic catheters also used

Umbilical catheters available in standard sizes

- 5F, 3.5F and 2.5F
- Single end hole (side-hole catheters associated with increase in thromboses)

Single lumen: vein or artery

Double or triple-lumen: vein only

- Verify informed consent; perform time-out
- Catheter prep - connect to a Luer-lock stopcock and flush with saline
- Cleanse umbilical stump and surrounding skin
- Remove with sterile saline prior to catheter insertion
- Cut to 1 to 1.5 cm from skin margin
- Maintain hemostasis

Portal, splenic or mesenteric veins

- If there is resistance to insertion or poor blood return, suspect inappropriate position

If used for resuscitation, advance until blood return (~ 2 cm below skin surface; may be less in preterm)

Prevents infusion into the liver

- Malposition
- Portal vein thrombosis/hepatic necrosis
- Sepsis
- Arrhythmia/perforation/tamponade
- Thrombotic endocarditis
- Hemorrhagic infarction in the lungs

- **Catheter malposition most common**
- Tip accidentally placed in/migrating to the liver can result in portal vein thrombosis and hepatic necrosis
- Tip placed high in the right atrium can lead to arrhythmias/tamponade
- ELBW infants: **monitor placement in these patients closely**

- Insert a second catheter of equal or smaller size into the lumen (original catheter remains in place)
- Advance gently into position
- If successful, remove the first catheter and suture and secure the indwelling catheter

Sepsis and Thrombosis

- Sepsis incidence noted to be 3% to 16%
- **Increases in infants receiving TPN and intralipids**
- Thrombosis may lead to thrombotic endocarditis and pulmonary hemorrhagic infarction
- Risk increases with prolonged catheter use

- Requires a constant infusion to prevent clotting
- Lab work and invasive monitoring

- Vasospasm
- Thrombosis/emboli
- Perforation
- Urachus catheterization
- IVH – intraventricular hemorrhage
- NEC – necrotizing enterocolitis
- Sepsis
- Hematuria/Hypertension
- Hemolysis
- Hemorrhage

Vasospasm

- Blanching/cyanosis of buttocks/lower extremities
- Thrombus formation or emboli with extensive ischemic injury and limb loss

Vasospasm may be helped by

- Warming the unaffected limb, repositioning the catheter to a lower position or catheter removal
- Accidental urachus catheterization can lead to urinary ascites

IVH (Intraventricular Hemorrhage) NEC (Necrotizing Enterocolitis)

- Retro-grade blood flow
- Transient increases in blood pressure
- Micro-emboli
- Rapid withdrawal/return of blood during sampling

Sepsis

- Increased risk in ELBW infants
- Infants with longer duration of antibiotic therapy

Hypertension

- May result from thrombi or other catheter-related effects

Remove as soon as possible (5-7 days)

Catheters should be removed one at a time

- Stop infusion of fluids
- Clip sutures with scissors
- Withdraw the catheter to about 5 cm
- Slowly withdraw catheter over a minimum of 5 minutes
- Monitor for bleeding

Umbilical Catheter Removal

Bleeding during removal:

Venous

- Apply pressure by lifting and pinching the skin just above the cord

Arterial

- Apply pressure just below the cord

Persistent bleeding

- Use hemostat to close vessel lumens



Case Studies

KidNet Case Study #1

UVC

- An umbilical catheter developed a leak at the luer lock connection
- A close examination revealed that the connector had a crack in it that allowed TPN, lipids, Fentanyl, and blood to leak out
- Fluid loss and inadequate medication contributed to a situation where the neonate was temporarily very unstable

KidNet Case Study #2

UAC

- A nurse was attempting to discontinue an umbilical artery catheter and while pulling gently on the line, the catheter separated below the suture close to umbilical site
- This resulted in a blood loss of approximately 13 ml of blood, and required a transfusion of 5 ml of packed red blood cells

PICC

- A PICC line was placed into the right antecubital vein of an extremely low birth weight infant
- Multiple x-rays following the next three days were read by many pediatric radiologists as being placed above the right atrium
- Confirmation through an echo showed that the PICC line had always been in the right ventricle
- The baby developed a non-life threatening pericardial effusion

KidNet Case Study #4

PICC

- A dual lumen PICC line was placed via the saphenous vein
- Seven weeks later during the removal attempt, the catheter would not freely pull back through the vein
- Despite warm compresses over the vessel, the catheter could not be pulled
- The patient underwent a cut-down procedure near the groin to remove the catheter



Questions and Answers

What are the challenges related to the management of central lines, especially central line associated bloodstream infections (CLABSI)?

What are some recommendations for addressing staff education, training and certification associated with PICCs and umbilical catheter insertion and care?

How does FDA handle recalls with medical devices?

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