

Background

Peripheral intravenous catheters (PIV) are the most placed device in the neonatal intensive care unit (NICU) requiring frequent attempts, with a brief duration due to complications which indicate removal before completion of treatment. PIVs have a patient safety risk of peripheral intravenous infiltration/extravasation (PIVIE); the severity can be mild, moderate, or severe depending on the swelling and tissue damage. PIVIE rates are one of the patient quality outcomes and are increasing in the NICU. Considering the increased risks of long-term consequences from tissue injury associated with PIVs, midline catheter devices (MCD), may improve quality and patient outcomes. MCDs are different than peripherally inserted central catheters (PICC); the endpoint is not centrally located, and it terminates deeper in an extremity.

Problem

PICOT: (P)For neonates in a level IV NICU, (I) will implementation of midline catheters, (C) compared to the use of non-midline PIVs, (O) reduce the incidence of serious PIVIEs, (T) six months after full implementation.

Purpose

This project aims to evaluate the effectiveness of midline catheter use in decreasing serious PIVIEs in a Level 4 NICU.

Methodology

- **Literature review:**
 - MCDs have longer than standard PIVs and offer longer dwell times.
 - Commonly used in patients who have difficult PIV access.
 - Recommendations to use methods for selecting appropriate vascular access devices.
 - Standard PIVs are the most placed device in the NICU yet have a risk for complications and harm.
 - MCDs need further reported data for effectiveness in reducing vascular injuries in NICU patients.
- **Revise NICU Appropriate Line Algorithm to clarify patient criteria for vascular access selection and include midline catheter devices (Table 1 & Table 2)**
- **Product Trial**
- **Benchmarking**
- **Create guidelines for the use of MCDs**
- **Staff education including a quick reference guide (Table 3)**
- **Utilize a specialized team for line insertion and management (Transport and Quality Team –TAQ)**
- **Data collection and analysis of PIVIEs and midline performance**

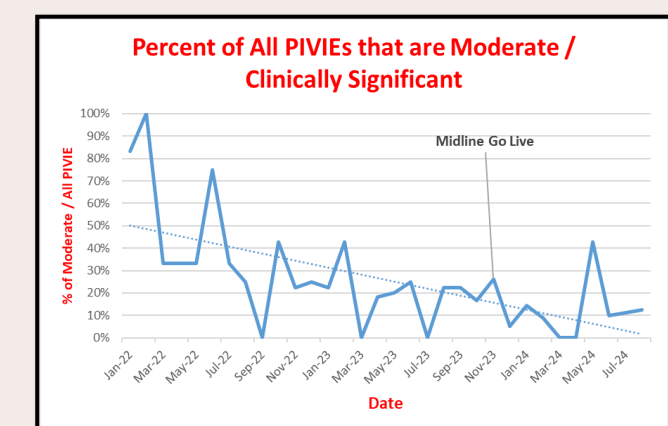
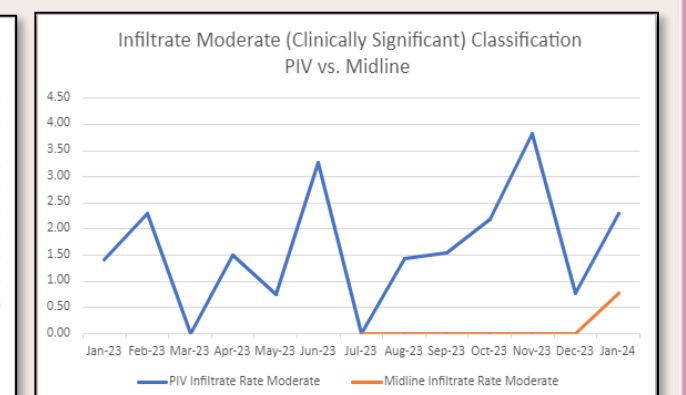
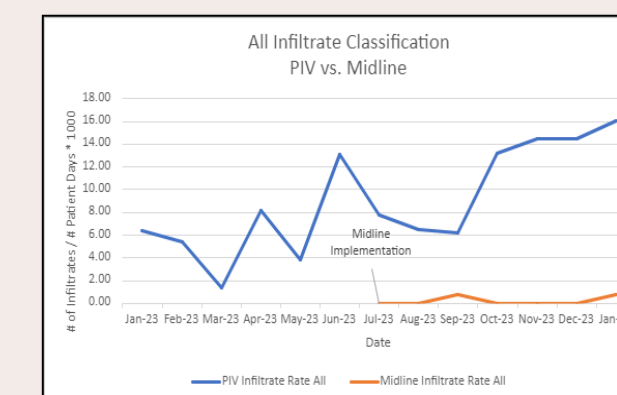
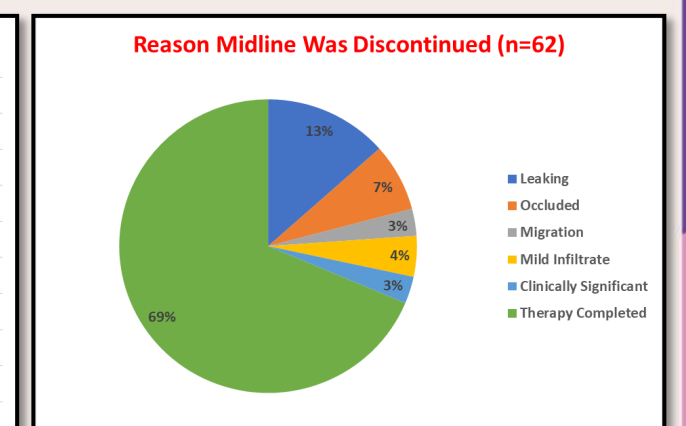
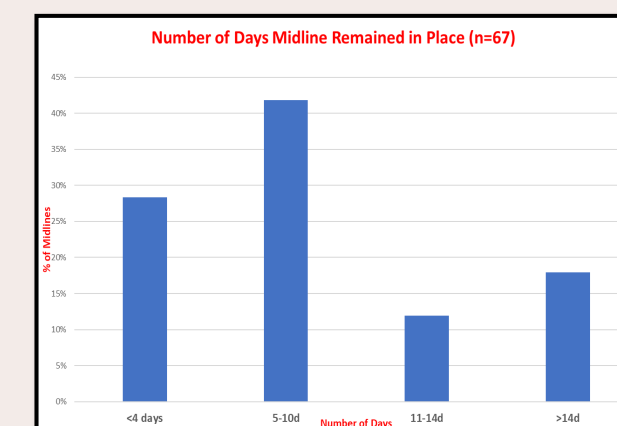
Evaluation

Data analysis six months post-implementation revealed:

- Midlines have longer dwell times >14 days, max 34d
- 69% less complications (patent until completion of therapy)
- Decrease in number of PIVIE events.

Outcomes

Moderate or severe classifications for MCDs were significantly lower at 0.76 versus traditional PIVs at 2.29 per 1000 patient days. Percent of PIVIES trending down.



Implications

- Improve patient safety
- Improve Patient experience
- Advance clinical practice

Table 1

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graph TD
    Title[When to place a Midine and/or a PIV]
    Title --> PIV
    Title --> Midline

    subgraph PIV
        PIV1[Start with line therapy 1-3 days]
        PIV2[Adequate Peripheral Veins]
        PIV3["Medication / Solution  
(pH < 9 and < 12)  
Non irritant (non-vesicant)  
Osmolarity < 900 mOsm/L"]
        PIV4[Blood transfusion]
        PIV5["Signs Rule Out for Antibiotics  
(48h blood)"]
        PIV6[Procedural Sedation]
    end

    subgraph Midline
        Midline1["Midline Insertion Therapy 2-30  
days"]
        Midline2["Poor Peripheral Access  
More than 3 IV days in 28 hours  
with Adequate Peripheral Veins for  
Insertion"]
        Midline3["Medication / Solution  
(pH < 9 and < 12)  
Non irritant (non-vesicant)  
Osmolarity < 900 mOsm/L"]
        Midline4[Blood Electrolytes]
        Midline5["Signs concern, until central line  
can be placed"]
    end

    PIV1 --> PIV2
    PIV2 --> PIV3
    PIV3 --> PIV4
    PIV4 --> PIV5
    PIV5 --> PIV6

    Midline1 --> Midline2
    Midline2 --> Midline3
    Midline3 --> Midline4
    Midline4 --> Midline5

    WhoCanPlace["Who can place  
Midlines: APP & TAC Team  
PIVs: APP & TAC Team"]

    Note["Middlines can be used as a secondary line  
for patients who also have a central line"]

    PIV6 --> Note
    Midline5 --> Note
  
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When to place a Midine and/or a PIV

PIV

- Start with line therapy 1-3 days
- Adequate Peripheral Veins
- Medication / Solution (pH < 9 and < 12)
Non irritant (non-vesicant)
Osmolarity < 900 mOsm/L
- Blood transfusion
- Signs Rule Out for Antibiotics (48h blood)
- Procedural Sedation

Midline

- Midline Insertion Therapy 2-30 days
- Poor Peripheral Access
More than 3 IV days in 28 hours
with Adequate Peripheral Veins for Insertion
- Medication / Solution (pH < 9 and < 12)
Non irritant (non-vesicant)
Osmolarity < 900 mOsm/L
- Blood Electrolytes
- Signs concern, until central line can be placed

Who can place
Midlines: APP & TAC Team
PIVs: APP & TAC Team

Middlines can be used as a secondary line for patients who also have a central line

Links to Resources:
 PIV Placement - Hospital Policy
 Procedure for Extravasation
 PIV Extravasation Incident Forms
 Non-Chemo Vesicant use with Treatment Plans
 Venous Phlebitis

Table 2

Consider placing a Central Line if ANY of the below are identified....				
Number/Time	Hemoglobin	Cardiac Condition	Arterial O ₂	Critical Access
<p>100% Sat</p> <p>Rate of ≥20% ABG</p> <p>Rate of ≥20% ABG</p> <p>Rate of ≥20% ABG</p>	<p>Cardiac Condition:</p> <ul style="list-style-type: none"> • MI • Congestive HF • High risk history (Dyslipid, elevated 	<p>4-6 hours of arterial</p> <p>4-6 hours of arterial</p> <p>4-6 hours of arterial</p> <p>4-6 hours of arterial</p>	<p>Critical Access (cannot</p> <p>Critical Access (cannot</p> <p>Critical Access (cannot</p> <p>Critical Access (cannot</p>	
<p>At least 10% of the Red</p> <p>At least 10% of the Red</p> <p>At least 10% of the Red</p> <p>At least 10% of the Red</p>	<p>Infections:</p> <ul style="list-style-type: none"> • >2 days (influenza, paratuberc) • >2 days (influenza, paratuberc) • >2 days (influenza, paratuberc) • >2 days (influenza, paratuberc) 	<p>Consider if at least</p> <p>Consider if at least</p> <p>Consider if at least</p> <p>Consider if at least</p>	<p>Successful insertion</p> <p>Successful insertion</p> <p>Successful insertion</p> <p>Successful insertion</p>	
<p>Assessment of trends</p> <p>Assessment of trends</p> <p>Assessment of trends</p> <p>Assessment of trends</p>	<p>Red High Risk Viscerics:</p> <ul style="list-style-type: none"> • Diabetes, Immunosuppression (steroids, • Diabetes, Immunosuppression (steroids, • Diabetes, Immunosuppression (steroids, • Diabetes, Immunosuppression (steroids, 		<p>Multiple IV access needed</p> <p>Multiple IV access needed</p> <p>Multiple IV access needed</p> <p>Multiple IV access needed</p>	
<p>Placement of Central Access</p> <p>Placement of Central Access</p> <p>Placement of Central Access</p> <p>Placement of Central Access</p>	<p>For treatment of</p> <p>For treatment of</p> <p>For treatment of</p> <p>For treatment of</p>	<p>At least 10% of the Red</p> <p>At least 10% of the Red</p> <p>At least 10% of the Red</p> <p>At least 10% of the Red</p>	<p>Extensive presymptomatic</p> <p>Extensive presymptomatic</p> <p>Extensive presymptomatic</p> <p>Extensive presymptomatic</p>	<p>One (1) for 2-3 days</p> <p>One (1) for 2-3 days</p> <p>One (1) for 2-3 days</p> <p>One (1) for 2-3 days</p>

Table 3

children's health

NECU paediatric Midline Catheter Management

children's health

NECU paediatric Midline Catheter Management

Overview / Purpose: A midline catheter is an extended distal intravenous peripheral catheter. It is inserted into the peripheral vein and treated to as an arm of greater blood flow in the proximal portion of the extremity (i.e., arm, leg, side, or jugular vein). This is not a central line. The primary goal of this reference guide is to provide guidance and recommendation for managing midline catheters in the NICU.

Assessment

- Assesses the entire extremity including catheter by location, using ACT (Assess, Count, Touch)
 - Within 30 minutes after placement
 - Within 1 hour of transfer from another location
 - Every 24 hours
 - **Every hour during or less than every 30 minutes.**
 - For patients 1300 grams or less when receiving blood products
 - For patients receiving a blood product with every permanent hardware change
 - For patients receiving a blood product with every change of catheter (connector, catheter, or catheter)
 - Every time the catheter is flushed

Flushing

- For intermittent access using a saline lock, flush:
 - Every shift
 - Prior to use
 - Immediately following use
 - CDS or a 10 mL or larger syringe for full flushing
 - When tubing the catheter, inject the flush and clamp the catheter prior to withdrawing the syringe/needle. Full displacement technique to prevent reflux of blood

Midpoint Circumference Measurement

Supplies needed: Measuring tape and surgical marker

- Measure from the acromion process of the scapula (shoulder) to the olecranon process (elbow) or measure from the tip of the nose to the knee
 - Mark and arm of blood to upper extremity or mid-thigh if blood is venous access using surgical marker as shown in picture below
 - Measure and document circumference at the marked endpoint on the extremity every 3-4 hours

Insertion Documentation

- Add the midline catheter in Epic from the LMA Addnote. Include the type of site, insertion circumference of the extremity being used, and any other pertinent information
- When caring for a midline catheter, documentation will be done on the IV assessment flowchart. Include the baseline and current circumference measurement of the extremity being used every 3-4 hours as well as any additional assessment findings

Documentation on an Existing Midline Catheter

- Click on the **IV assessment** flowchart in Epic
- Locate the midline catheter and complete all fields as appropriate:
 - Status
 - Circumference - **document every 3-4 hours**
 - Predicted score per assessment
 - Document midline circumference every 3-4 hours

When to Consult the TAQ (Trauma & Quality) Team

- **Suspected infection**
 - Signs and symptoms of phlebitis
 - Pain at site, erythema, and/or palpable tenderness
 - Documented catheter exit site temperature more than 0.5°C in 48 hours assessments
- Documented exit of the midline catheter
- Catheter Consider the position of the patient
- Document changes in the location of the catheter:
 - Cool to touch
 - Delayed catheter yield > 3 seconds
 - Decreased range of motion or pain with mobility
- Any other ACT assessment concerns
- Non-occlusive or contaminated dressings
- Dressing changes should be performed!
- Dressing changes are done every 7 days or PRN

Helpful Tips

- Line changes for midlines are done using aseptic technique
- Label IV tubing with the peripheral insertion site
- CT ensure the appropriate access
- Assessments tips to blood in the site include:
 - Decrease line appropriacy during rounds
 - Additional communications with midline catheter
- CT connect, Bumpup, or Bariatric should NOT be infused through a midline catheter
- Midline catheter CAN be administered through a midline catheter
- **Blood products can only be administered through a CDS or LMA**
- Blood cultures may only be obtained from a catheter culture catheter with blood placement
- Do not use for blood specimen collection
- If difficult access, complete a site line for PIV