Reducing PIVC Complications and Informing Clinicians: Technology & 5P’s

Greg Schears, MD
Rochester, MN
Disclosures

I am a consultant for B.Braun & Christie Medical Holdings
Objectives

• Characterize factors that may lead to vein loss and PIVC complications.

• Discuss efforts being used to keep veins patent, prolong dwell time and reduce complications.

• Compare the advantages and disadvantages of Ultrasound and Near Infrared technology to help with this process.
Vein Loss & PIVC Complications
## PIV Failure Rates 1990-2014

<table>
<thead>
<tr>
<th>Study Type</th>
<th>Incidence of Failure (%)</th>
<th>Median</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prospective randomized controlled</td>
<td>36, 37, 39, 40, 45, 51, 55, 63, 60</td>
<td>43%</td>
<td>46%</td>
</tr>
<tr>
<td>Prospective observational</td>
<td>23.5, 25.5, 32, 36.5, 47.5, 47.6, 51, 65, 66, 66, 69.2, 77</td>
<td>48%</td>
<td>49%</td>
</tr>
<tr>
<td>Retrospective</td>
<td>22.4, 95</td>
<td>58.7%</td>
<td>59%</td>
</tr>
</tbody>
</table>

Helm, RE, et al, 2015, JIN 38 (3) 189-203
## PIV Failure Modes

<table>
<thead>
<tr>
<th>Mode of Peripheral IV Catheter Failure</th>
<th>Range</th>
<th>Mean</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catheter-related phlebitis</td>
<td>0.1%-63.3%</td>
<td>15.4%</td>
<td>9.0%</td>
</tr>
<tr>
<td>Catheter infiltration</td>
<td>15.7%-33.8%</td>
<td>23.9%</td>
<td>22.2%</td>
</tr>
<tr>
<td>Catheter occlusion/mechanical failure</td>
<td>2.5%-32.7%</td>
<td>18.8%</td>
<td>22.8%</td>
</tr>
<tr>
<td>Catheter dislodgment</td>
<td>3.7%-9.9%</td>
<td>6.9%</td>
<td>7.0%</td>
</tr>
<tr>
<td>Catheter-related infection</td>
<td>0.0%-0.44%</td>
<td>0.2%</td>
<td>0.2%</td>
</tr>
</tbody>
</table>

*Summary of data from Tables 4 to 8.*
# Risk Factors for Peripheral Intravenous Catheter Failure: A Multivariate Analysis of Data from a Randomized Controlled Trial

## Table 1. Baseline Clinical Characteristics and Crude Outcome Counts by Type of Catheter Failure

<table>
<thead>
<tr>
<th>Category</th>
<th>All catheters, % (n = 5,907)</th>
<th>Occlusion (n = 1,512)</th>
<th>Accidental removal (n = 375)</th>
<th>Phlebitis (n = 273)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male (reference)</td>
<td>64.3</td>
<td>77.9 (1.00)</td>
<td>21.8 (1.00)</td>
<td>13.4 (1.00)</td>
</tr>
<tr>
<td>Female</td>
<td>35.7</td>
<td>104.5 (1.34, 1.21–1.49)(^a)</td>
<td>21.0 (0.97, 0.77–1.20)</td>
<td>20.5 (1.51, 1.17–1.93)(^a)</td>
</tr>
<tr>
<td><strong>No. of comorbidities</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 (reference)</td>
<td>23.9</td>
<td>82.8 (1.00)</td>
<td>26.2 (1.00)</td>
<td>16.1 (1.00)</td>
</tr>
<tr>
<td>1</td>
<td>21.4</td>
<td>89.9 (1.09, 0.93–1.27)</td>
<td>19.5 (0.74, 0.54–1.02)</td>
<td>15.1 (0.94, 0.64–1.37)</td>
</tr>
<tr>
<td>2 or more</td>
<td>54.7</td>
<td>87.0 (1.05, 0.92–1.20)</td>
<td>20.4 (0.78, 0.61–0.99)(^b)</td>
<td>15.6 (0.97, 0.72–1.32)</td>
</tr>
<tr>
<td><strong>PIVC size</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 gauge (reference)</td>
<td>55.4</td>
<td>88.0 (1.00)</td>
<td>18.9 (1.00)</td>
<td>15.2 (1.00)</td>
</tr>
<tr>
<td>18 gauge or larger</td>
<td>15.4</td>
<td>74.3 (0.84, 0.72–0.98)(^b)</td>
<td>27.0 (1.43, 1.08–1.88)(^a)</td>
<td>18.6 (1.22, 0.88–1.68)</td>
</tr>
<tr>
<td>22 gauge or smaller</td>
<td>29.2</td>
<td>91.2 (1.04, 0.92–1.16)</td>
<td>23.8 (1.26, 0.99–1.60)</td>
<td>14.9 (0.98, 0.73–1.31)</td>
</tr>
</tbody>
</table>

\(^a\) \(^b\) Significantly different from the reference category at the 0.05 level.
### Table 3. Independent Risk Factors for Occlusion

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>HR</th>
<th>95% CI</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand compared with forearm</td>
<td>1.47</td>
<td>1.28–1.68</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Female sex</td>
<td>1.44</td>
<td>1.30–1.61</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Antibiotics infused through IV</td>
<td>1.41</td>
<td>1.25–1.59</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Hydrocortisone infused through IV</td>
<td>1.36</td>
<td>1.03–1.80</td>
<td>.028</td>
</tr>
<tr>
<td>Current infection</td>
<td>1.27</td>
<td>1.12–1.44</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Antecubital fossa compared with forearm</td>
<td>1.27</td>
<td>1.08–1.49</td>
<td>.004</td>
</tr>
<tr>
<td>Upper arm compared with forearm</td>
<td>1.25</td>
<td>1.04–1.50</td>
<td>.016</td>
</tr>
<tr>
<td>Second through fifth cannula compared with first cannula</td>
<td>1.17</td>
<td>1.01–1.35</td>
<td>.037</td>
</tr>
<tr>
<td>Inserted in OT/rad compared with ward</td>
<td>0.80</td>
<td>0.67–0.94</td>
<td>.009</td>
</tr>
<tr>
<td>Antipyretic infused through IV</td>
<td>0.76</td>
<td>0.59–0.97</td>
<td>.030</td>
</tr>
</tbody>
</table>

Infect Control Hosp Epidemiol 2014;35(1):63-68
## Table 2. Independent Risk Factors for Phlebitis

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>HR</th>
<th>95% CI</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female sex</td>
<td>1.64</td>
<td>1.28–2.09</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Size 18 gauge or larger compared with size 20 gauge</td>
<td>1.48</td>
<td>1.08–2.03</td>
<td>.014</td>
</tr>
<tr>
<td>Current infection</td>
<td>1.41</td>
<td>1.05–1.89</td>
<td>.022</td>
</tr>
<tr>
<td>Age</td>
<td>0.99a</td>
<td>0.98–0.99</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Other drugs infused through IV</td>
<td>0.72</td>
<td>0.56–0.92</td>
<td>.009</td>
</tr>
</tbody>
</table>

**Note.** Findings are from a multivariate Cox proportional hazards regression model with conditional risk sets that included phlebitis events as time-dependent covariates. CI, confidence interval; HR, hazard ratio; IV, intravenous catheter.

a Increase in age by 1 year decreased the HR by 1.1%.
Ideal Vein for PIV Access

• Not across joint*
• Adequate size*
• Adequate SQ tissue
• Healthy vein wall
• Straight pathway
• Forearm > Hand & AC*

• No valves within the area of catheter
• No thrombus
• Good venous flow
• Tip not near tortuositities or bifurcations

INS Policies and Procedures, Section 3 VAD Placement p 52, 2016*
Preserving Veins & Reducing Complications: 5 P’s of Peripheral Vascular Access Best Practice
Five P’s of VA Best Practice

• Pre-Access Assessment
• Picking Optimal Site
• Preventing Thrombosis
• Placement
• Preservation
1st P - Pre-Access Assessment & Device Choice
Ideal VA Encounter-All Pts!

• Provide Pre-Access Assessment
• Pt Hx, Understand Therapy Goals
• Examine Pt, Consider Options
• Educate & Partner with the Patient
• Select & Optimally Place Best Device
• Uncomplicated Course-Success!!!
• Everyone’s Satisfied
Vascular Access Device Selection

Marcia Ryder, PhD MS RN

VASCULAR ACCESS PLANNING
(NON-EMERGENT USE, REASSESS DAILY)
FOR MULTIPLE ACCESS NEEDS, SELECT A MULTILUMEN CATHETER

- **Purpose of Vascular Access**
  - NUTRITION
    - ≤ 10% Dextrose
      - < 7 days
        - Vascular Integrity: Good → PIV → MID
        - Vascular Integrity: Poor → PIC → TEM → TUN
      - > 7 days
        - Vascular Integrity: Good → PIC → TEM → TUN
        - Vascular Integrity: Poor → PIC → TEM → TUN
    - > 10% Dextrose
      - < 3 months
        - Vascular Integrity: Good → TUN
        - Vascular Integrity: Poor → PIC → TEM → TUN
      - > 3 months
        - Vascular Integrity: Good → TUN
        - Vascular Integrity: Poor → PIC → TEM → TUN

- **MEDICATION/FLUIDS**
  - Non-irritating
    - < 7 days
      - Vascular Integrity: Good → TUN
      - Vascular Integrity: Poor → PIC → TEM → TUN
    - ≥ 7 days
      - Vascular Integrity: Good → TUN
      - Vascular Integrity: Poor → PIC → TEM → TUN
  - Irritants/Vesicants
    - < 3 months
      - Vascular Integrity: Good → TUN
      - Vascular Integrity: Poor → PIC → TEM → TUN

*Home Use—Consider stable access PIC, TUN, PORT as appropriate. For patients with short-term therapy, good access, and good home care resources, PIV may be considered. Discuss with their case manager.*

J Nursing Care Quality, 13 (2), 77-85, 1998
Vascular Access Device Selection Algorithm

**Medication/Fluid Characteristics**

- **Good Vascular Integrity**
  - Duration <5 days
    - PIV or US Guided PIV
    - Midline
    - US Guided Midline
    - PICC
  - Duration >5 days
    - Midline
    - PICC
- **Poor Vascular Integrity**
  - <3 days
    - PIV or US Guided PIV
    - Midline
  - >3 days
    - US Guided PIV
    - Midline
    - PICC
    - Non-Tunneled

**Non-vesicant Osmolarity < 900mOsm/L**

**Vesicant or Osmolarity of >900mOsm/L**

**Medications/Solutions known to cause Phlebitis**
- Albumin
- Amiodarone (Cordarone)
- Amphotericin B
- Penicillin + immuno-adsorbent therapy
- Ampicillin, Penicillin, Ticarcillin, Cephalosporins
- Methotrexate
- Calcium
- Ceftriaxone, other β-lactams
- Chemotherapeutic agents (majority)
- Ciprofloxacin, other quinolones
- Diltiazem
- All Vasoconstrictors, Nonsteroidal Anti-Inflammatory Drugs, Dopamine, Dobutamine (vesicants)
- Epinephrine, vasopressin
- Doxycycline
- Erythromycin = irritant
- Forskolin
- Imitaprim
- Iron Dextran
- Morphine concentration based
- Naftifin (cyclosporine)
- KCl concentrations > 40 mEq/L
- TPN (>900 mOsm/L)
- Promethazine = vesicant
- TPN
- Trimethoprim/Sulfamethoxazole
- Vancomycin (Bactrim/Septin)
- Zidovudine (Azithromycin)

References:
1. Infusion Nursing Standards of Practice 2016.

PICC Excellence, Nancy Moureau, PhD, BSN, CRNI, CPUI, VA-BC
VAD Selection Programs
Implementation Problem

• No standardized method of screening
• No standard means of quantifying difficulty of access or # viable targets
• Must incorporate modern technology and current practices
• Need scoring system that promotes communication and research
Visual Screening
Palpation Screening
U/S Screening
NIR Screening
NIR Screening
Documentation/ Scoring Tool Needed

• Must be easy to use
• Must allow POC assessment
• Must be practical, fast
• Must conform with practice
• Must have a scoring system
• Will need to be validated and applied prospectively.
Screening Tool Score

5 categories for Peripheral Vein Viable Targets

V - Easily locate accessible veins by sight
T - Easily locate accessible veins by palpation
N - Easily locate accessible veins with near-infrared vein visualization
U - Accessible veins only identified with ultrasound
0 - Lacks adequate veins for peripheral venous access
Quantification

A. > 10 Optimal Choices
B. 5-10 Optimal Choices
C. 1-5 Optimal Choices

Qualifiers

Site: B-Bilateral, L-Left, R-Right
Pre-Access Assessment Score

• Visible, Bilateral, 1-5 veins: V, B, C
• Palpable, Bilat, 1-5 veins: T, B, C
• Near Infrared, Bilat, > 10: N, B, A
Performing Pre-Access Assessment

- Must do a **viable target** assessment
- Direct visual **limited** and palpation assessment just not practical.
- US messy, slow, hard for large areas
- NIR is the **only** practical approach that allows timely, comprehensive peripheral venous assessment
2nd P - Picking an Optimal PIV Site
INS Site Choice Advice

Key Points

• Smallest gauge that will accommodate prescribed therapy

• Avoid areas of joint flexion, including the hand, all surfaces of the wrist, and the antecubital fossa.

• Choose insertion sites in the forearm to increase dwell time, decrease complications, promote self-care, and prevent accidental removal.

INS Policies and Procedures, Section 3 VAD Placement p 52, 2016
Site Selection

- Most distal site on extremity
- Avoid sites below previous insertion, infiltration, phlebitis or bruises
- Avoid areas of flexion such as wrist and antecubital fossa
- Metacarpal, cephalic, basilic and median veins are recommended because of their size and location.

INS, Infusion Nursing: Evidence Based Approach, Saunders, Elsevier, 2010, p 461
PIV Failure Rates 1990-2014

<table>
<thead>
<tr>
<th>Study Type</th>
<th>Incidence of Failure (%)</th>
<th>Median</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prospective randomized controlled</td>
<td>36, 18 37, 58 39, 50 40, 6 45, 59 51, 19 55, 20 63 60</td>
<td>43%</td>
<td>46%</td>
</tr>
<tr>
<td>Prospective observational</td>
<td>23.5, 61 25.5, 62 32, 63 36.5, 64 47.5, 65 47.6, 51 65, 66 66, 54 69.2, 55 77 53</td>
<td>48%</td>
<td>49%</td>
</tr>
<tr>
<td>Retrospective</td>
<td>22.4, 67 95 68</td>
<td>58.7%</td>
<td>59%</td>
</tr>
</tbody>
</table>

Helm, RE, et al, 2015, JIN 38 (3) 189-203
Insanity: doing the same thing over and over again and expecting different results.

Albert Einstein
PIV Catheter Outcome Factors

- Site Choice
- Skin / Vein Integrity
- Catheter Materials
- Insertion Technique
- Tip Location
- Catheter/ Vein Size
- Catheter Movement
- Stabilization
- Infusate / Fluid Jet
- Other
If we are going to advance PIV catheter insertion and reduce complications, we must embrace technology and better understand the dynamic relationship of the catheter within the vein particularly its tip position relative to other intravenous structures!
# Method For Assessment

<table>
<thead>
<tr>
<th>Ideal Vein</th>
<th>Eye</th>
<th>Palp</th>
<th>U/S</th>
<th>NIR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Across a Joint</td>
<td>✓</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Vein Size</td>
<td>+/-</td>
<td>+/-</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Straight Pathway</td>
<td>+/-</td>
<td>+/-</td>
<td>+/-</td>
<td>✓</td>
</tr>
<tr>
<td>Avoid Valves</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>✓</td>
</tr>
<tr>
<td>Identify Obstruction</td>
<td>0</td>
<td>+/-</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Venous Flow</td>
<td>0</td>
<td>0</td>
<td>+/-</td>
<td>✓</td>
</tr>
<tr>
<td>Catheter Tip- Valve</td>
<td>0</td>
<td>0</td>
<td>+/-</td>
<td>✓</td>
</tr>
</tbody>
</table>
Bad Day
Have You Ever?

• Blown a vein due to hitting a valve?
• Caused more pain to a patient from hitting a valve? Second stick?
• Had the IV pump beep incessantly because the IV catheter tip bumps up against a valve?
• Have reduced IV flow because the IV catheter tip was up against a valve?
Vessel Hematoma from Valve Strike
Valve-o-logy

- Valves are well known to interfere with optimal PIV insertion-functionality
- Difficult to predict where valves will be
- Rarely can see with the naked eye
- Very difficult to identify with U/S
- NIR easily identifies valves by milking vein.
- Thus NIR very helpful/necessary for optimal PIV positioning regardless of vein difficulty
Picking an Optimal Access Site

Must Avoid

Must Find

Must Avoid
3rd P – Preventing Venous Thrombosis
Modern Virchow's Triad

- Stasis
- Hypercoagulability
- Vessel wall injury
# Risk of Thrombosis

Catheter to vein ratio and cases of venous thromboembolism.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Venous thromboembolism</th>
<th></th>
<th>RR</th>
<th>95% CI</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes (n = 4)</td>
<td>No (n = 132)</td>
<td>Total (n = 136)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Catheter to vein ratio</td>
<td>18–33%</td>
<td>34–45%</td>
<td>46–70%</td>
<td>&gt;71%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 (25)</td>
<td>66 (50)</td>
<td>67 (49)</td>
<td>1.04</td>
<td>0.99–1.09</td>
</tr>
<tr>
<td></td>
<td>0 (0)</td>
<td>44 (33)</td>
<td>44 (33)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 (75)</td>
<td>18 (14)</td>
<td>21 (15)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0 (0)</td>
<td>4 (3)</td>
<td>4 (3)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Based on log binomial generalised linear model (analysed as a continuous variable); CI = confidence interval; RR = relative risk.

## Impact of Catheter Size to Venous Flow

Table 1—Experimental Results Using Combinations of Three Outer Tube (Cylinder) Diameters and Four Inner Wire (Catheter) Diameters

<table>
<thead>
<tr>
<th>Measure</th>
<th>Unobstructed</th>
<th>Inner Wire 0.67 mm (2F)</th>
<th>Inner Wire 1.33 mm (4F)</th>
<th>Inner Wire 2.0 mm (6F)</th>
<th>Inner Wire 2.6 mm (8F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outer tube, 4 mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$D_{cath}/D_{cyl}$</td>
<td>0</td>
<td>0.16</td>
<td>0.32</td>
<td>0.48</td>
<td>0.64</td>
</tr>
<tr>
<td>Average flow, mL/min</td>
<td>17</td>
<td>12</td>
<td>6.7</td>
<td>3.4</td>
<td>1.2</td>
</tr>
<tr>
<td>Relative flow, %</td>
<td>100</td>
<td>69</td>
<td>40</td>
<td>20</td>
<td>6.9</td>
</tr>
<tr>
<td>SD, mL/min</td>
<td>0.42</td>
<td>0.11</td>
<td>0.15</td>
<td>0.034</td>
<td>0.016</td>
</tr>
<tr>
<td>$P$ value*</td>
<td>...</td>
<td>$3.7 \times 10^{-6}$</td>
<td>$6.8 \times 10^{-11}$</td>
<td>$3.8 \times 10^{-7}$</td>
<td>$3.6 \times 10^{-11}$</td>
</tr>
<tr>
<td>Outer tube, 5 mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$D_{cath}/D_{cyl}$</td>
<td>0</td>
<td>0.13</td>
<td>0.25</td>
<td>0.38</td>
<td>0.51</td>
</tr>
<tr>
<td>Average flow, mL/min</td>
<td>41</td>
<td>33</td>
<td>25</td>
<td>17</td>
<td>10</td>
</tr>
<tr>
<td>Relative flow, %</td>
<td>100</td>
<td>81</td>
<td>60</td>
<td>42</td>
<td>25</td>
</tr>
<tr>
<td>SD, mL/min</td>
<td>0.15</td>
<td>0.75</td>
<td>0.70</td>
<td>0.16</td>
<td>0.092</td>
</tr>
<tr>
<td>$P$ value*</td>
<td>...</td>
<td>$1.0 \times 10^{-5}$</td>
<td>$8.5 \times 10^{-6}$</td>
<td>$9.0 \times 10^{-6}$</td>
<td>$5.3 \times 10^{-11}$</td>
</tr>
<tr>
<td>Outer tube, 6 mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$D_{cath}/D_{cyl}$</td>
<td>0</td>
<td>0.11</td>
<td>0.21</td>
<td>0.32</td>
<td>0.42</td>
</tr>
<tr>
<td>Average flow, mL/min</td>
<td>81</td>
<td>52</td>
<td>47</td>
<td>39</td>
<td>29</td>
</tr>
<tr>
<td>Relative flow, %</td>
<td>100</td>
<td>64</td>
<td>58</td>
<td>49</td>
<td>36</td>
</tr>
<tr>
<td>SD, mL/min</td>
<td>0.98</td>
<td>0.58</td>
<td>0.40</td>
<td>2.7</td>
<td>0.75</td>
</tr>
<tr>
<td>$P$ value*</td>
<td>...</td>
<td>$5.3 \times 10^{-10}$</td>
<td>$1.0 \times 10^{-6}$</td>
<td>.0028</td>
<td>$6.7 \times 10^{-4}$</td>
</tr>
</tbody>
</table>

*Dcath = diameter of the catheter; Dcyl = diameter of the cylinder.

*Compared with the next smallest catheter size.
Optimal Catheter/Vein Ratio
Suboptimal Catheter/Vein Ratio
Optimal Catheter/Vein

• Difficult to estimate real vein size for most PIV access using unaided eye.
• Palpation even more difficult.
• U/S good but harder to know straightaways and can’t easily see valves or tortuosities
• NIR easily identifies straightaways and projects exact vein width with some products.
• Thus NIR is very helpful/necessary for optimal PIV catheter/vein strategies to preserve flow & integrity.
Picking Optimal Access Sites
4th P – Placing a Short Peripheral IV
US & NIR

• Complementary technologies that help identify additional viable targets that your eyes and fingers can’t find.

• Assist with process of obtaining access as well.

• NIR has additional abilities to screen for targets, identify valves and more easily judge catheter to vein ratios.

• Both technologies are necessary for modern vascular access best practice

• Each has a learning curve, US a bit steeper
Avoid Getting Lost
Rolling, Rolling, Rolling
Sorry, No More Rolls!
5th P – Preserving Integrity of Catheter Site
• Limited data on the natural history of accessed or attempted access veins

• We don’t follow patients prospectively to look for recannulation of veins or persistent loss of veins

• Experience suggests incremental target loss of peripheral and central vessels through access and infusion
Preventing Complications

Iatrogenic

- Vessel injury from poor site choice, valves, bifurcations, infiltrations, tortuositities leading to infiltration and phlebitis
- Thrombosed vessels from oversized catheters
- Medications and fluids injurious to endothelium
- Poor catheter stabilization
Summary

- Pre-Access Assessment necessary to quantify “Viable Venous Targets” & device choice algorithms
- Optimal site choice should reduce “obstructive” & phlebitic complications
- Attention to the Catheter/Vein Ratio should reduce thrombosed veins
- Addressing these issues will improve current practice and disrupt the status quo.
Thank You

Questions?

schears.gregory@mayo.edu