Extended Dwell Peripheral IV and Impact on Patient Outcomes

CentraCare Health
February 8, 2017

Objectives:
1. Review the existing data regarding the dwell time and complications of the short peripheral catheter (SPC).
2. Identify new technology available to address these and improve clinical outcomes related to SPCs.
3. Review current published clinical outcomes using this technology.
4. Describe the facility product evaluation: background, implementation, and results of a 2.25 in product evaluation.

Short Peripheral Catheters (SPC):

Literature Review:
SPCs are the most frequently used invasive device in hospitals.
- In the United States, more than 25 million patients get a peripheral venous line each year.
- National average: 40% Success rate with first attempt.
- 27% of patients endure 3 or more attempts.

Short Peripheral Catheters (SPC):

Facility Data:
- SPCs are the most frequently used invasive device in hospitals.
- Average daily SPC volume 200-225
- National average: 40% Success rate with first attempt.
- PICC/IV Team: 80% success rate first attempt with or without ultrasound
- 27% of patients endure 3 or more attempts.
- PICC/IV Team: 3 or attempts - 21%
Traditional Peripheral IV Catheter

Vascular Access Challenges

Growing “hard stick” or Difficult IV Access (DIVA) patient population requires deeper vessel access with steep insertion angles
- Poor vasculature (frequent fliers, acuity, fragile/damaged veins, drug use)
- Bariatric patients (33% of population obese by 2016)
- CKD, Type 2 DM, Elderly

DIVA Patients often receive Midlines, PICCs and Central Lines:
- CLABSI Risks: $45,000 per occurrence, HAC reimbursement risk
- High cost of lines, maximal barrier kits, and clinician time

Significant patient dissatisfaction with vascular access outcomes (HCAHPS)

Vascular Access Challenges

SPC’s – 60% of patients require multiple attempts to gain access
High complication rate due to vessel damage during insertion
- Complications limit dwell time
- Require unnecessary restarts
- Interrupt therapy

Why Do We Need A Guidewire?

“Cannulation of deep vessels and proximal vessels is associated with poor USGIV survival.”

At ≥ 1.2 cm depth, the USGIV has 29% chance of dwelling at 48 hours.

Facility Outcomes Compared to Literature Review

Background:
• The Vascular Access Team (VAT) at this 450 bed county teaching facility with Level 1 Trauma Center places approximately 800-1000 peripheral IVs (PIV) per month.
• Many are difficult access patients with poor outcomes using conventional longer catheters with ultrasound guidance.
• Facility maintained a 96 hour PIV site rotation policy.
• There is a critical need for a peripheral device that could offer an extended dwell experience for the patient population served.

Purpose:
To evaluate a new 2.25” PIV device with coiled tip guidewire to determine first attempt success, dwell time and patient satisfaction results.

Current Facility Outcomes:
• 67% of the PIV dwell ≤ 24 hours,
• 15% dwell ≤ 48 hours
• 82% of PIVs documented had a dwell time of 48 hours or less
• Only 4% (23/525) of total PIVs remained in place at 96 hours

Where’s the hole in practice??
Add an Extended Dwell PIV catheter to practice.
• This catheter would be placed at the discretion of the PICC/IV nurse; no MD order would be required.
• An extended dwell peripheral IV is inserted most commonly into the basilic, brachial, or cephalic veins.
• Can be inserted below or above the A/C.
• Longer dwell time than a short peripheral catheter (from 6 to 30 days).
• Average dwell time 7.69 days to 16.6 days. Can be placed for any hospital stay that is projected to last longer than 4-5 days (not requiring CVC placement).
• Cost is less than PICC or Midline
• Estimated cost: $15.00 plus equipment or approximately the cost of 2 ultrasound PIV insertions ($33.80)
Guidewire PIV 2.25 inch - Case Study:
A 58 year old male was transferred from an outside hospital admitted to the Surgical ICU for further evaluation of altered mental status and multiple co-morbidities including:

- 3rd degrees AV block, S/P Left SCV pacemaker placement, when he was stabbed in the chest
- chronic systolic heart failure
- traumatic brain injury
- Hep C
- HTN
- LV thrombus
- CRF
- alcoholic hepatitis
- DM Type 2

He also had acute renal failure on admission which was treated with fluids and is resolved on discharge.

He was admitted with a 5FR Dual lumen valved PICC in the R upper extremity placed in the previous facility.

IV medications/infusions:

- Heparin infusion
- MTN fluids
- Magnesium and potassium electrolyte replacement
- Vancomycin
- Pipercillin
- Percodex
- Fentanyl infusion and PRN
- Propofol infusion and PRN

He was evaluated to have poor peripheral venous integrity and infusion therapy required more access than the dual lumen catheter.

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2.25 BC Blood Control Intravascular Catheter with Guide wire
Ultrasound Guided Peripheral IV

**Nitinol Guidewire**
Coiled tip guidewire engineered to navigate steep insertion angles and tortuous vessel anatomy foratraumatic delivery and optimal catheter positioning. Designed to prevent unnecessary needle advancement that traditionally leads to vessel damage and complications.

**Echogenic Needle and Guidewire Design**
Echogenicity of needle and guidewire visibility aids in insertion when using Ultrasound devices.

**Rapid Flash Technology**
Allows for the immediate indication of vessel entry through the rapid flash of blood occurring in the catheter. Instantaneous indication mitigates the potential for intima damage or vessel perforation.

**Power Injectable**
FDA Cleared for power injection with contrast media at 6ml/sec, 300psi.

**Blood Control Valve**
Designed to significantly reduce blood flow into the catheter hub after insertion until a secure Luer connection is made.

**Needlestick Safety**
Built-in push button needlestick safety enhances protection for both the healthcare worker and patient.

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How the Coiled tip guidewire works
## Case Medical Results: First Attempt, Time, Satisfaction

<table>
<thead>
<tr>
<th>Data Elements</th>
<th>Guidewire PIV</th>
<th>Conventional SPC</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients Enrolled</td>
<td>123</td>
<td>125</td>
<td></td>
</tr>
<tr>
<td>First Attempt Success</td>
<td>89%</td>
<td>47%</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Patient Attempt Count &lt; 1</td>
<td>110 (89%)</td>
<td>59 (47%)</td>
<td></td>
</tr>
<tr>
<td>Patient Attempt Count = 1</td>
<td>13 (11%)</td>
<td>62 (50%)</td>
<td></td>
</tr>
<tr>
<td>Patient Attempt Count &gt; 3</td>
<td>0 (0%)</td>
<td>4 (3%)</td>
<td></td>
</tr>
<tr>
<td>Total Number Insertion Attempts</td>
<td>136</td>
<td>195</td>
<td></td>
</tr>
<tr>
<td>Number of Catheters Per Patient</td>
<td>1.1</td>
<td>1.6</td>
<td></td>
</tr>
<tr>
<td>Time to Placement (minutes)</td>
<td>5.6</td>
<td>12.5</td>
<td>&lt; .001</td>
</tr>
</tbody>
</table>

### Average Values

- Patient Satisfaction at Insertion: 4.6 vs. 3
- Comfort Rating Comparison: 4.2 vs. 2.8
- Patient Satisfaction Performance: 4.8 vs. 2.8
- Average Clinician Satisfaction: 4.0
- Likely to Recommend AccuCath: 5.0

## Case Medical Results: Complications, Dwell Time, COT

<table>
<thead>
<tr>
<th>Data Elements</th>
<th>Guidewire PIV</th>
<th>Conventional SPC</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number Patients/Complication Percent</td>
<td>10/123 (8%)</td>
<td>65/125 (52%)</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Phlebitis</td>
<td>1 (1%)</td>
<td>11 (9%)</td>
<td></td>
</tr>
<tr>
<td>Infiltration</td>
<td>3 (2%)</td>
<td>33 (26%)</td>
<td></td>
</tr>
<tr>
<td>Dislodgement</td>
<td>3 (2%)</td>
<td>6 (5%)</td>
<td></td>
</tr>
<tr>
<td>Occlusion</td>
<td>0 (0%)</td>
<td>7 (5%)</td>
<td></td>
</tr>
<tr>
<td>Leaking</td>
<td>0 (0%)</td>
<td>7 (5%)</td>
<td></td>
</tr>
<tr>
<td>Infection</td>
<td>0 (0%)</td>
<td>3 (15%)</td>
<td></td>
</tr>
<tr>
<td>Patent ci/Pain</td>
<td>0 (0%)</td>
<td>2 (15%)</td>
<td></td>
</tr>
<tr>
<td>Completion of Therapy (COT)</td>
<td>89% (10/123)</td>
<td>34% (43/125)</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Average Dwell Time Days (hours)</td>
<td>4.4 (105)</td>
<td>1.5 (85)</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Average Complication Occurrence Days (hours)</td>
<td>4.2 (100)</td>
<td>1.4 (23)</td>
<td>&lt; .001</td>
</tr>
</tbody>
</table>

## New York Methodist Hospital Emergency Department

New York-Presbyterian Hospital System, Columbia University, Weill Cornell Medical College Affiliate

**Primary Investigator:**
Jerry Chiricolo, MD, Past Chair, ACEP Ultrasound Section Chair, Division of Clinical Ultrasound Director, Division of Emergency Ultrasound Director, Emergency Ultrasound Fellowship Assistant Professor
Methodist Results: First Attempt Success

<table>
<thead>
<tr>
<th>Data Elements</th>
<th>Guide wire PIV</th>
<th>Conventional SPC</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients Enrolled</td>
<td>100</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>First Attempt Success</td>
<td>85%</td>
<td>22%</td>
<td>&lt; .0001</td>
</tr>
<tr>
<td>Patient Attempt Count = 1</td>
<td>85 (85%)</td>
<td>22 (22%)</td>
<td></td>
</tr>
<tr>
<td>Patient Attempt Count = 2</td>
<td>15 (15%)</td>
<td>62 (62%)</td>
<td></td>
</tr>
<tr>
<td>Patient Attempt Count = 3</td>
<td>0 (0%)</td>
<td>16 (16%)</td>
<td></td>
</tr>
<tr>
<td>Total Number of Attempts</td>
<td>115</td>
<td>194</td>
<td></td>
</tr>
<tr>
<td>Catheters Per IV Start</td>
<td>1.2</td>
<td>1.9</td>
<td>&lt; .0001</td>
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</tbody>
</table>

Methodist Results: Satisfaction Scores

<table>
<thead>
<tr>
<th>Data Elements*</th>
<th>Guide wire PIV</th>
<th>Conventional SPC</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Satisfaction Insertion</td>
<td>4.6</td>
<td>2.4</td>
<td>&lt; .0001</td>
</tr>
<tr>
<td>Patient Comfort Comparison</td>
<td>4.6</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>Physician Satisfaction</td>
<td>4.8</td>
<td>3.3</td>
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</table>

Evangelical Community Hospital Results

<table>
<thead>
<tr>
<th>Data Elements</th>
<th>Guidewire PIV</th>
<th>Conventional SPC Literature</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Number Enrolled</td>
<td>95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First Attempt Success</td>
<td>85.3%</td>
<td>40%</td>
<td>&lt; .0011</td>
</tr>
<tr>
<td>Catheters Per IV Start</td>
<td>1.2</td>
<td>2.18</td>
<td>&lt; .0021</td>
</tr>
<tr>
<td>Complication Percent</td>
<td>17.9%</td>
<td>47%</td>
<td>&lt; .0011</td>
</tr>
<tr>
<td>Therapy Completion Percent</td>
<td>82%</td>
<td>47%</td>
<td>&lt; .0014</td>
</tr>
<tr>
<td>Dwell Time</td>
<td>58 hrs.</td>
<td>44 hrs.</td>
<td>&lt; .0021</td>
</tr>
<tr>
<td>Patient Satisfaction Insertion</td>
<td>100%</td>
<td>42%</td>
<td>&lt; .0011</td>
</tr>
<tr>
<td>Patient Satisfaction Overall Performance</td>
<td>97.9%</td>
<td>42%</td>
<td>&lt; .0001</td>
</tr>
</tbody>
</table>

Evangelical Community Hospital, Lewisburg, PA

Primary Investigator:
- Norman Rick Anderson, BSN, RN, CRNI, Coordinator, Vascular Access Team, Past President and Board of Directors, Pennsylvania Central Chapter INS
- WIRB approved prospective, sequential use of Blood Control Intravascular Catheter with Coiled Tip Guidewire with retrospective comparison to literature – First Attempt Success, Complications, Completion of Therapy, Dwell Time, Patient and Clinician Satisfaction with Vascular Access Team

Benefits:
- Extended dwell PIV insertion avoids unnecessary repeated peripheral cannulation.
- Catheter materials are power injectable.
- Can be inserted by specialist nurses; easy to train.
- Shorter procedure time than PICC placement.
- CXR or use of ECG tip locator is not required to verify catheter tip position.
- Lower risk of thrombosis.
- Lower risk of CLABSI than central lines.

INS Practice Criteria:
- Consider the infusate characteristics in conjunction with anticipated duration of infusion therapy and availability of peripheral vascular access sites (INS, 2014)
- Avoid use with continuous vesicant, PN, infusates with osmolarity >900mOsm/L (INS, 2016)
Potential cost savings:

If we could eliminate 5% (12.5 PIV) reduction of the total PIV daily volume (Average daily volume-250) 12.5 x $27.80 = $347.50 x 365 = $126,837.50 cost reduction – final operational cost for Extended Dwell PIV insertion.

Clinical Evaluation of an Extended Dwell Peripheral IV in a Level 1 Trauma Center

Sizes: 20 Ga x .25 inch or 18 Ga x .25 inch

Patient Selection Criteria:
- Expected IV therapy required for > 6 days
- Multiple PIVs required to administer prescribed therapy
- MICU/SICU/PICU patient
- Renal patient with AV fistula
- Burn patient
- Failed PIV placement x 2

Vascular Access device Risk Assessment

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infusate</td>
<td></td>
</tr>
<tr>
<td>Characteristic 1</td>
<td></td>
</tr>
<tr>
<td>Characteristic 2</td>
<td></td>
</tr>
</tbody>
</table>

Peripheral vein availability

- IV therapy < 7 days
- Empirical antibiotics
- Short term IV therapy

Duration of Therapy

- IV therapy < 7 days
- IV therapy > 7 days
- Empirical antibiotics
- Short term IV therapy
- Long term IV therapy
- Multidose
- Failed PIV placement

Diagnostics and Procedures

- CT scan
- MRI
- Duplex ultrasound
- Lab results
- Physician defined IV therapy duration

Patient Co-morbidities

- None
- Chronic hemodialysis
- Active thromboembolic disease
- Known presence of fistula
- History of AV fistula
- History of UE DVT
- Known structural vascular system abnormalities (e.g., venous stenosis or occlusion)
Insertion:
- ANTT (Aseptic No Touch Technique). Follow manufacturer’s instructions for insertion.

Equipment:
- CVC dressing kit: provides a sterile drape.
- Use 5 ml 2% Chlorhexidine Gluconate/70% Ethanol
- Sterile gloves—either from CVC kit or Biogel
- Sterile NS pre-filled syringe
- 6” PIV Extension
- CHG antimicrobial disc: preferably small size, but the regular size will work
- Sterile short probe cover
  - Scan arm first, identify insertion site and vessel, then put on probe cover as in PICC insertion.
- Transparent Adhesive Dressing
- 1% Lidocaine- buffered—You will need to administer Lidocaine prior to putting on sterile gloves.

Surveillance:
- Daily Monitor:
  - Site
  - Blood return
  - Phlebitis s/s
  - Infiltration s/s
  - Dressing intact
  - Weekly and/or PRN sterile dressing change

Daily Monitoring:

Performance Results
- Data was collected on 100 patient insertions with trial device.
- The average number of conventional PIV placements prior to the trial device was 4.4 per patient.
- No bacterial phlebitis or catheter associated infection were reported with the trial device.
- The average vascular access device risk assessment score documented was 7.5
Performance Results

<table>
<thead>
<tr>
<th>First Attempt Success</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>81</td>
<td>86%</td>
</tr>
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</table>

Dwell Time

<table>
<thead>
<tr>
<th>Av. Dwell Time (Days)</th>
<th>Median</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.5 days</td>
<td>4 days</td>
<td>1-33 days</td>
</tr>
</tbody>
</table>

Clinician Satisfaction*

<table>
<thead>
<tr>
<th>At Insertion</th>
<th>4 of 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>At Removal</td>
<td>4 of 5</td>
</tr>
</tbody>
</table>

Case Study Outcomes:

- He was evaluated to have poor peripheral venous integrity and infusion therapy required more access than the dual lumen catheter.
- An 18 Ga x 2.25 inch Guidewire PIV was placed using aseptic no touch technique with image guidance in the right lateral brachial vein. A sterile TSM dressing and antimicrobial disc was applied on insertion.
- A sterile TSM dressing with antimicrobial disc was changed at seven (7) day intervals.
- The catheter was removed on the day of transfer to a long term care facility, the IV was no longer needed.
- A total of 14 day dwell, no S/S of infiltration or phlebitis were documented.
- Blood culture results were negative.

Conclusions:

The 2.25” device with coiled tip guidewire offers a new alternative in PIV placement for difficult stick patients that is easy to use and performs better than the current conventional PIV options used by this VAT.

Implications for Practice:

- When PICC/IV Team is consulted, insertion of Blood Control Intravascular Catheter with Guide wire in all ICU and Burn patient populations
- Comparison of lower arm vs upper arm length of dwell, complications.
- Evaluation in the pediatric population
Selecting the Appropriate Blood Control Intravascular Catheter with Guide wire

<table>
<thead>
<tr>
<th>Considerations</th>
<th>2.25&quot; (5.7cm)</th>
<th>3.2cm (8.1cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vessel Depth</td>
<td>Lower arm</td>
<td>Lower arm</td>
</tr>
<tr>
<td>Vessel Location</td>
<td>Lower arm</td>
<td>Upper arm</td>
</tr>
<tr>
<td>Ultrasound</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Estimated Duration of Therapy</td>
<td>1-6 days</td>
<td>1-29 days</td>
</tr>
<tr>
<td>Vessel Access</td>
<td>Venous or arterial</td>
<td>Venous or arterial</td>
</tr>
<tr>
<td>Power Injection</td>
<td>300psi at 6ml/sec</td>
<td>300psi at 6ml/sec</td>
</tr>
<tr>
<td>Patient Types</td>
<td>Standard use to improve PIV outcomes, Power injection studies.</td>
<td>Ability to open frad access on demand. Power injection studies.</td>
</tr>
</tbody>
</table>

DIVA3 Protocol
- Consider vessel depth required for 50% catheter purchase. 45/50 rule.
- Use after 3 failed conventional PIV attempts.
- Use after 2 failed conventional PIV attempts in the 50% population of high risk patients.
- Use after 3 failed conventional PIV attempts in difficult access.
- Use after 2 failed conventional PIV attempts in difficult access.

Questions?
Thank you!

Mary Deschneau, RN, BSN, VA-BC
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St. Paul, MN
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651 280 9748

PENDING CLINICAL STUDIES ON 2.25" BC

North Shore Hospital NY, Chris Raha, MD
- Prospective study, one arm with 2.25" Blood Control Intravascular Catheter with Guide wire device
- First attempt success, complications, dwell-time, completion of therapy, patient and clinician satisfaction

Carolinas Medical Center, David Kiefer, MD
- Longer PIV catheters for EI and IJ use, n=100
- 2.25" Blood Control Intravascular Catheter with Guide wire compared to BD 1.88" and Arrow 2.5"
- First attempt success, complications, completion of therapy, physician preference

Thomas Jefferson University Hospital, Matt Fields, MD
- Randomized, Controlled DIVA patients in the ED, n=300
- Comparison of BD 1.88", PowerGlide and 2.25" Blood Control Intravascular Catheter with Guide wire device
- First attempt success, complications, dwell-time, completion of therapy, patient and clinician satisfaction