Complication Rates for PICCs after Rewire

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Disclosures
I have no conflicts of interest and nothing to disclose.

Learning Objectives
• Describe the difference between catheter related bloodstream infection and central line associated bloodstream infection
• List 3 factors that contribute to the development of catheter related bloodstream infection
• Describe the difference between PICC insertion via the new-site method and the rewire/exchange method
• List 2 benefits of PICC rewire/exchange

Background
• PICC – Peripherally Inserted Central Catheter
• Silicone or polyurethane
• Inserted into a large vein in the peripheral circulation and threaded into central circulation
• Catheter tip placed in the superior vena cava or inferior vena cava

Benefits
• Extended dwell time
• Parenteral nutrition
• Chemical irritants, vesicants, pH > 8, pH < 6
• Stable access for continuous infusions
• Blood draws
• Preserves peripheral venous system
• Decreased pain/stress associated with IV restarts
• Inserted with light to no sedation

Complications/Risks
• Catheter damage/breakage/leaking
• Occlusion
• Thrombus, fibrin sheath
• Malposition
• Infection
• Catheter-related venous thrombosis
• Dysrhythmias
• Embolization of catheter fragment

Sources: Pettit, 2002; Westergaard et al., 2013.
Background

- Infection
  - Catheter-related bloodstream infection (CRBSI)
    - Clinical definition
    - Laboratory testing that identifies catheter as source of the bloodstream infection (BSI)
  - Central line associated bloodstream infection (CLABSI)
    - Surveillance

(O'grady et al., 2011)

- CRBSI
  - Bacteremia originating from an IV catheter
  - Positive peripheral blood culture
  - Clinical manifestations of infection
    - Fever, chills, hypotension
    - Positive catheter tip culture with same organism, OR
    - Positive central and peripheral blood cultures
      - >5:1 ratio CVC vs. peripheral, OR
      - Differential time to positivity, 2 hours

(Gnannt et al., 2014)

- CLABSI
  - Laboratory confirmed BSI
  - Central venous catheter (CVC) indwelling 48 hours before BSI
  - Not related to other infection

(Centers for Disease Control and Prevention, 2017)

- Infection
  - Local infection
  - CRBSI
    - Multiple lumens
    - Increased dwell time
    - Parenteral nutrition administration
    - Younger age (<1 year of age)
    - Early vs. late infection

(Advani et al., 2011; Barrier et al., 2012; Castelli et al., 2007; Fonseca et al., 2017; Levy et al., 2010; Milstone, et al., 2010; O'Brien et al., 2013)

- PICC malfunction
  - Occlusion
    - Small catheter size
    - Blood draws/blood products
    - Ineffective flushing
  - Catheter damage/breakage/leaking
  - Malposition
    - Migration/dislodgment

(Barrier, et al., 2012; Gnannt et al., 2017; Pettit, 2002; Thiagarajan, et al., 1997; Westergaard et al., 2013)

- Two methods of PICC insertion
  - New-site insertion
    - Most common
    - PICC placed through catheter introducer inserted through intact skin
    - Modified Seldinger technique
  - Exchange/Rewire
    - PICC placed through existing skin/subcutaneous tract
    - Only considered if there are no signs of infection

(Barrier et al., 2012; Barrier et al., 2013; Castelli et al., 2007; Hromek et al., 2017; Levy et al., 2010; Milstone et al., 2010; O'Brien et al., 2013)
Background

- PICC Rewire/Exchange Procedure
  - Existing PICC cut, then serves as a guide for insertion of the wire into the existing puncture site
  - Existing catheter is removed over the wire
  - New sterile catheter is placed over the wire (McCoy et al., 2011)

- PICC Rewire/Exchange
  - No alternative vein is available for new-site puncture
  - Occluded/stenotic vessels
  - Collateral vessels
  - Used to preserve future venous access
  - Impossible to sterilize subcutaneous tract left by the old PICC
  - Possible increased risk of CRBSI (Gnannt et al., 2011; McCoy et al., 2011; Yang et al., 2012)
Background

• Review of the literature
  — CVC Rewire/Exchange
    • Meta-analysis, adult population
      — Association between catheter rewire/exchange and
        » Catheter colonization
        » Catheter exit-site infection
        » Catheter-related bacteremia

(Ost et al., 1997)

Background

• Review of the literature
  — CVCs in pediatric burn patients
    • New-site: 16.6 CRBSI per 1,000 line days
    • Rewire: 25.2 CRBSI per 1,000 line days
  — Adult CVCs showed the opposite trend
    • New-site: 13.7 CRBSI per 1,000 line days
    • Rewire: 0 CRBSI per 1,000 line days

(O’Mara, M. et al., 2007)

Background

• Review of the literature
  — PICC repair versus rewire/exchange
    — Pediatric population
    — CLABSI rate 30 days after
      • Repair: 2.0 per 1,000 line days (4.3%)
      • Rewire: 4.0 per 1,000 line days (10.9%)
      • p = 0.11
      • Adjusted for antibiotics, p = 0.039

(Gnannt et al., 2017)

Background

• Review of the literature
  — PICC rewire/exchange versus new-site
    — NICU population
    — CLABSI within 7 days of insertion
      • Significantly higher rate of insertion-related CLABSI
      • 25-fold increase in CLABSI when adjusted for confounders

(Meiley et al., 2011)

Purpose

• Analyze PICC complication rates after placement via the rewire/exchange method, as compared to all PICCs placed via the new-site insertion method
Materials & Methods

- Retrospective study
- Electronic medical record & PACS system
- January 2014 through December 2014
- Fisher’s exact test

Materials & Methods

- Catheter dwell time
- Reason for rewire
- Indication of PICC placement
- Complications

Materials & Methods

- Definition of infection
  - Positive blood culture while PICC indwelling
    - Peripheral or central
  - Early infection (insertion related)
    - ≤ 30 days from PICC insertion
  - Late infection (line maintenance related)
    - > 30 days from PICC insertion

Results: Demographics

- Age
<table>
<thead>
<tr>
<th>Age Range</th>
<th>New-Site</th>
<th>Rewire</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 days – 15 years</td>
<td>58 (5.3%)</td>
<td>52 (33.1%)</td>
</tr>
<tr>
<td>≥ 30 days</td>
<td>166 (15.2%)</td>
<td>52 (33.1%)</td>
</tr>
<tr>
<td>Median</td>
<td>0.4 years</td>
<td>3.0 years</td>
</tr>
</tbody>
</table>

- Dwell time
<table>
<thead>
<tr>
<th>Dwell time</th>
<th>New-Site</th>
<th>Rewire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>20 days</td>
<td>50 days</td>
</tr>
<tr>
<td>Median</td>
<td>21 days</td>
<td>44 days</td>
</tr>
</tbody>
</table>

Demographics: Patient Population

<table>
<thead>
<tr>
<th>Patient Population</th>
<th>New-Site</th>
<th>Rewire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neonates</td>
<td>58 (5.3%)</td>
<td>8 (5.1%)</td>
</tr>
<tr>
<td>Oncology</td>
<td>216 (19.8%)</td>
<td>52 (33.1%)</td>
</tr>
<tr>
<td>TPN</td>
<td>166 (15.2%)</td>
<td>52 (33.1%)</td>
</tr>
<tr>
<td>Cardiac</td>
<td>147 (13.5%)</td>
<td>33 (14.4%)</td>
</tr>
<tr>
<td>Antibiotics</td>
<td>298 (26.4%)</td>
<td>20 (12.7%)</td>
</tr>
<tr>
<td>Osteomyelitis</td>
<td>52 (4.8%)</td>
<td>1 (0.6%)</td>
</tr>
<tr>
<td>Metabolic</td>
<td>11 (1%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Nephrotic Syndrome</td>
<td>8 (0.7%)</td>
<td>3 (1.9%)</td>
</tr>
<tr>
<td>Other</td>
<td>119 (10.9%)</td>
<td>5 (3.2%)</td>
</tr>
</tbody>
</table>

Results: Reasons for Rewire

- Malposition
- Catheter Damage
- Occluded Lumen
- Inadequate
- Other

- 70
- 28
- 23
- 16
- 6
### Results: Complications

<table>
<thead>
<tr>
<th>Complications</th>
<th>Rewire (n=157)</th>
<th>New-Site (n=1100)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>70 (44.6%)</td>
<td>134 (12.2%)</td>
<td>0.000</td>
</tr>
<tr>
<td>Infection</td>
<td>23 (14.6%)</td>
<td>53 (4.8%)</td>
<td>0.000</td>
</tr>
<tr>
<td>Line Malfunction</td>
<td>19 (12.1%)</td>
<td>21 (1.9%)</td>
<td>0.000</td>
</tr>
<tr>
<td>Malposition</td>
<td>27 (17.2%)</td>
<td>44 (4%)</td>
<td>0.000</td>
</tr>
<tr>
<td>Bleeding</td>
<td>0 (0%)</td>
<td>1 (0.09%)</td>
<td>0.000</td>
</tr>
<tr>
<td>Thrombosis</td>
<td>1 (0.6%)</td>
<td>15 (1.4%)</td>
<td>0.709</td>
</tr>
</tbody>
</table>

### Results: Infection

<table>
<thead>
<tr>
<th>Infection</th>
<th>Rewire (n=157)</th>
<th>New-Site (n=1100)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total infections</td>
<td>23 (14.6%)</td>
<td>53 (4.8%)</td>
<td>0.000</td>
</tr>
<tr>
<td>Early (&lt;30 days)</td>
<td>6 (3.8%)</td>
<td>16 (1.5%)</td>
<td>0.030</td>
</tr>
<tr>
<td>Late (&gt;30 days)</td>
<td>17 (10.8%)</td>
<td>37 (3.4%)</td>
<td>0.000</td>
</tr>
</tbody>
</table>

### Catheter Size: New-Site

- Number of Patients

### Catheter Size: Rewire

- Number of Patients

### Results: Number of Lumens

- Percentages of single and double lumen catheters for New-Site and Rewire.

### Results: Complications

- Per 1,000 Line Days
- Total Complications
- Infections
- Malposition
- Line Malfunction
- Total Line Days
Limitations

- Retrospective
- Single center study
- Small cohort of rewire method (n=157)

Discussion

- Our findings:
  - New-site: 1.3 infections/1,000 line days
  - Rewire: 2.6 infections/1,000 line days
- O’mara et al. (2007) found:
  - New-site: 16.6 infections/1,000 line days
  - Rewire: 25.2 infections/1,000 line days

References

- Gnannt et al. (2017) found:
  - Rewire: 25.2 infections/1,000 line days
  - New-site: 16.6 infections/1,000 line days

Conclusions

- Rewire complication rate higher
- Much higher rate of line malfunction and malposition in rewire
- Despite the risk, rewire still has a place in practice
- Risk vs. benefit

References

- Gnannt et al. (2017) found:
  - Rewire: 25.2 infections/1,000 line days
  - New-site: 16.6 infections/1,000 line days
References


Development and Evaluation of a Comic Book to Teach Agricultural Safety to Migrant & Seasonal Agricultural Worker (MSAW) Families

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Disclosures
• The authors have no disclosures

Learning Objectives
Participants will be able to:
• Describe the process of developing an educational learning tool in the form of a comic book (graphic novel)
• Discuss how MSAW parents and children perceive the message of safety in the agricultural work camp comic book

Background
• Best evidence reports that about every 3-days one child dies in an incident that is agriculture-related and every day about 38 children are injured.
• While comic books can be thought of an “easy read” often associated with lower levels of reading ability, they are quite the opposite.
• Comics ask the reader to interpret the text and images on the page.
• North American Guidelines for Children’s Agricultural Tasks

Purpose
• The purpose of this study: develop a bilingual culturally-specific comic book (graphic novel) to teach Latino MSAW parents and children about safety working and living in an agricultural work camp; and in a mixed-methods study test the comic book for satisfaction and usability.

Research questions
1) How do MSAW parents and children perceive the message of safety in the agricultural work camp comic book in terms of satisfaction, helpfulness and usability?
2) What suggestions for improvement do MSAW parents and children offer before publication?
**Methods**

- This is a multidisciplinary, multistate one-group mixed-methods study that employed the use of satisfaction and usability surveys and focus groups.
- Criterion-based purposeful sampling of Latino MSAW parents and youth 8-to-18 years of age was recruited in Missouri September-October 2016.
- An ethnographic framework was used.

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**Existing resources**

- Children’s images from photovoice study

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- Creating a storyboard

Choosing font style

Safety concerns for children

Common NAPMAP anticipatory guidance teachings
Bilingual covers

Bilingual comic book - cover
Study sample

• Adults
  – Six males, 6 females
• Children
  – Six boys, 4 girls
• All worked as migrant farmworkers in southeast part of Missouri in Missouri Bootheel
• Conducted one Sunday in the afternoon after church

Demographics

GENERAL:
• Male = 12, female = 10
• Age: average 28 years; 8 < 18
• US nativity: 59%
• Students: 50%
• Language at home: 23% Spanish > English; 23% English > Spanish; 50% spoke equally Spanish and English

ADULTS:
• Marital status: 58% married
• Employment: 33% harvest fruits/vegetables; 9% stay at home parent, packing plant, other ag employment, non-ag employment
• Living in US: average 17.6 years (range 5-30)
• Education: 75% some high school, 16% graduated high school, 8% some college

Satisfaction- two questions

Satisfaction:
91% were very satisfied or somewhat satisfied with the comic book
91% thought the information in the comic book was helpful or very helpful

Usability Scale – 10 questions

<table>
<thead>
<tr>
<th>Question</th>
<th>Adults</th>
<th>Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>I think I would like to use this comic book frequently</td>
<td>83.3%</td>
<td>70%</td>
</tr>
<tr>
<td>I thought the comic book was easy to follow</td>
<td>100%</td>
<td>90%</td>
</tr>
<tr>
<td>I found comic book was well put together</td>
<td>92%</td>
<td>100%</td>
</tr>
<tr>
<td>I think most people would learn from this comic book very quickly</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>I felt very sure learning from the comic book</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Focus group comments

• Themes
  – From parents
    • Wanted comic book to state youth should not be allowed to work in the fields
    • Parents do not want their children working in the fields because it is dangerous
    • Working in the fields make them sick
    • Mothers especially did not want their teenage daughters working in the fields
  – From youth
    • They do not want to work in the fields
    • They do not like working in the fields
    • They work in the fields only because they have to help their families

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• Richard Aschenbrand, Columbus College of Art & Design, Columbus, Ohio
• National Children’s Center for Rural and Agricultural Health and Safety, Marshfield, Wisconsin

FUNDING for proposal: Safety in the agricultural work environment comic book developed and evaluated for Latino Migrant Families
Central States Center for Agricultural Safety and Health (CS-CASH) Pilot Project Grant
Websites that provide guidelines for children’s work in agriculture

- www.nagcat.org
- www.marshfieldclinic.org/saghaf
- www.marshfieldclinic.org/modelpolicy
- www.cultivatesafety.org/cba
- www.marshfieldclinic.org/youthequip