Peripheral IVs:

THINK BIG.
LOOK SMALL.

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Objectives

• Review data surrounding risks associated with Peripheral IVs (PIVs)
• Discuss how care and maintenance of PIVs relates to the changing healthcare landscape
• Identify strategies to lessen risks associated with PIV complications and sequelae

BSI Definitions

Primary Bloodstream Infections (BSI)

Laboratory-confirmed bloodstream infections (LCBI) that are not secondary to a community-acquired infection or an HAI meeting CDX/NHSN criteria at another body site

• CR-BSI Catheter Related BSI¹
  • A clinical definition used when diagnosing & treating patients
  • More thoroughly identifies the catheter as the source
  • Not used for surveillance

• CLA-BSI Central Line Associated BSI²
  • Used for surveillance
  • A laboratory-confirmed bloodstream infection (LCBI) where central line (CL) or umbilical catheter (UC) was
    • in place for >2 calendar days on the date of event, with day of device placement being Day 1 AND
    • in place on the date of event or the day before.


Peripheral IVs are the most frequently used invasive device in hospitals¹

• 0.2–0.7 per 1,000 device-days infection rate⁴

### TABLE 4. Subgroup Analyses of Studies of Short-term Intravascular Devices

<table>
<thead>
<tr>
<th>Device</th>
<th>All studies</th>
<th>Studies requiring microbial concentration from central catheters</th>
<th>Studies requiring microbial concentration from all devices cultured</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peripheral IV catheters</td>
<td>10 (0.5–0.7)</td>
<td>9 (0.4–0.9)</td>
<td>9 (0.4–0.9)</td>
</tr>
<tr>
<td>Midline catheters</td>
<td>9 (0.9–0.9)</td>
<td>9 (0.9–0.9)</td>
<td>9 (0.9–0.9)</td>
</tr>
<tr>
<td>Arterial catheters (axillary)</td>
<td>14 (1.2–2.2)</td>
<td>14 (1.2–2.2)</td>
<td>14 (1.2–2.2)</td>
</tr>
<tr>
<td>Peripherally inserted arterial catheters</td>
<td>15 (1.0–2.1)</td>
<td>5 (0.3–0.3)</td>
<td>4 (0.3–0.3)</td>
</tr>
<tr>
<td>Nonsheathed central venous catheters</td>
<td>70 (0.2–2.0)</td>
<td>60 (0.2–2.0)</td>
<td>50 (0.2–2.0)</td>
</tr>
<tr>
<td>Sheathed central venous catheters</td>
<td>9 (0.7–1.2)</td>
<td>7 (0.5–0.5)</td>
<td>7 (0.5–0.5)</td>
</tr>
<tr>
<td>Cholecath (percutaneous)</td>
<td>18 (1.0–2.0)</td>
<td>18 (1.0–2.0)</td>
<td>18 (1.0–2.0)</td>
</tr>
<tr>
<td>Percutaneous catheters (axillary)</td>
<td>13 (1.0–2.0)</td>
<td>11 (1.0–2.0)</td>
<td>10 (1.0–2.0)</td>
</tr>
<tr>
<td>Marella, axillary catheters</td>
<td>16 (0.4–2.5)</td>
<td>16 (0.4–2.5)</td>
<td>16 (0.4–2.5)</td>
</tr>
</tbody>
</table>

*RI = risk index; CI = confidence interval; IV = intravenous; TIV = intravascular.
Trinh, et al

Peripheral Venous Catheter—Related Staphylococcus aureus Bacteremia

- 24 S. aureus bacteremias
- 12% of all device-related S. aureus bacteremias were caused by PVCs
- Average treatment in this study was 19 days
- Some serious complications
  - 2 patient deaths and one transfer to hospice
  - 2 I&D of local site infections
  - Upper extremity DVT from PICC placed to treat PIV BSI
  - 10 events that would be reportable to CMS today
    - 8 MRSA bacteremias
    - 2 C. diff


Trinh (continued)

Risk Factors

- Antecubital fossa (67%)
- Placement in Emergency Room (67%)
- Placement outside of the hospital (16%)
- 2 from outside facilities
- 2 field starts

Pujol, et al

A Comparison of Bloodstream Infections in Central and Peripheral Venous Catheters

- Prospective study OUTSIDE of the ICU (Oct. 2001 – March 2003)
- 150 catheter-related infections (147 pts)
  - 77 PVC-related (0.19 per 1,000 pt days)
  - 73 CVC-related (0.18 per 1,000 pt days)
  - PVC related infections originated from lines placed in the ER 42% of the time
  - No CVCs were placed in ER
  - S. aureus more prevalent as pathogen in PIV vs. CVC (53% vs. 33%)

Pujol M et al., J Hosp Infect 2007;67:22-9
• Number of days to onset
  • Emergency Room: 3.7 days
  • Nursing units: 5.7 days
• *S. aureus* was more prevalent in peripheral lines, but MRSA was about the same
• Patients with *S. aureus* had more complications than from other organisms
  • Empyema, septic arthritis (including patients with prosthetic joints)
  • The risk of *S. aureus* seeding a prosthetic joint is estimated to be 34%
  • Significant not only for patients but for mandatory reporting now taking place in the United States

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**Not Without Risk**

Ritchie 2007
(New Zealand)

Looked at 345 PIVs

- 22/345 had signs of infections (6%)
  - 6/44 in greater than 72 hours (14%)
  - 16/301 in less than 72 hours (5%)

Hong 2008
(Korea)

- Purulent thrombophlebitis from IV; positive for *C. albicans*
- Developed fungal spondylitis in vertebrae
- Patient died

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**Agency for Healthcare Research and Quality (AHRQ): Morbidity and Mortality Rounds on the Web**

- Case study of 75 year old man
  • History of CAD & CHF
  • Admitted for CHF exacerbation
  • PIV in for 4 days
  • RN requested orders to leave IV in an additional day or two because placement (given edema) would be difficult
  • On day 6
    - Patient developed erythema at the IV site
    - Later that day developed fever and chills
    - Blood cultures grew MRSA
- Subsequently
  • Patient complained of back pain
  • MRI of the spine revealed epidural abscess
  • Abscess fluid positive for MRSA
- Treatment
  • 6 weeks of intravenous antibiotics
  • Estimated to have cost hundreds of thousands of dollars

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The PIV Connection

• Trial Purpose
  • Implement intervention aimed at intraluminal route of bloodstream infection
• Initial Observation
  • 44.1% reduction in BSI in ICUs and 31.9% outside the ICU
  • Expanded house-wide including peripheral lines
    • Additional efforts yielded
      • 31.9% further reduction in CLABSI rates
      • 43.5% reduction from baseline
• Unintended finding
  • PIVs may directly contribute to what gets reported as CLABSI

Methodist Hospitals, NW Indiana

• Background
  • 674 beds
  • Previous standard of care for PIVs
    • Routine replacement every 72-96h
    • Transparent film and tape dressings
    • Basic PIV policy not reflective of recent guideline updates
  • 13 years of PIV related LC-BSI data
  • Fall 2013 infection cluster

Methodist Hospitals, NW Indiana
A Move to Clinical Indication

• Building the Case
  • Benefits of a longer dwell
  • Economic benefits
    • “WIIFM”
• Creating a PIV Bundle
  • Policy revision
  • Materials conversions
  • Education and support
• Implementation and Evaluation
  • Increased nursing efficiency
  • Improved patient experience
  • Reduced risk of infection
  • Improved infection rates
  • Reduction in material costs

M. DeVries. Oral abstract, AVA Annual Scientific Meeting, September 2015
Methodist Hospitals: 1 Year Post Implementation

37% Reduction in House-wide LC-BSIs
19% Reduction in PIV related BSIs
48% Reduction in PIV Kit usage
68% Fewer CLABSIs (compared to NHSN prediction)
Reduced IV "sticks"
Positive patient feedback
Positive staff feedback

M. DeVries. Oral abstract, AHA Annual Scientific Meeting, September 2015

Affordable Care and PIVs: It Pays to Pay Attention

Value Based Purchasing

As part of the Affordable Care Act, congress has authorized the inpatient Value Based Purchasing Program, which provides a data reporting infrastructure for hospitals to help ensure quality patient outcomes

- Value Based Purchasing program is part of the Centers for Medicare & Medicaid Services (CMS)
- CMS efforts have been linked to the Medicare payment system to improve healthcare quality, which includes quality of care provided in the inpatient setting

Accessed on April 26, 2013
The VBP Domains

- Clinical Process of Care
- Patient Experience of Care
- Outcome Domain
- Efficiency
- Safety

How can PIVs Impact ACA Measures?

- Safety (20%)
- Process
- Patient Experience
- Efficiency (25%)
- Outcomes
- Nursing time, restarts

- Re-sticks (pain, anxiety, low success rate)
- Infections (skin breaches, bloodstream access)

A Call to Action
Cochrane Peripheral Vascular Diseases Group

- Assessed impact of removing peripheral catheters when clinically indicated versus removing and re-siting routinely
- Found no conclusive benefit in changing PIV routinely (eg. every 72 hours to 96 hours)
- Looked at phlebitis as well as bacteremia

**Results:**

- Changing for clinical need rather than on routine schedule reduced the rate of bacteremia 44%
  - OR = 0.57  P= 0.37
- 24% increase in phlebitis in the clinical change group
  - OR= 1.24 P=0.09

Cochrane Update 2013

- Seven additional trials were reviewed with a total of 4895 patients
- No significant difference in the catheter related BSI group between clinical indication and routine change
- No significant difference in phlebitis rate between the two groups
- No difference whether the infusion was continuous or intermittent
- Cannulation costs were lower (approximately 7 Australian dollars in the clinical indication group)

Lancet summary

- Routine replacement increases:
  - Costs
  - Staff time
  - Number of procedures patients must undergo
- We need to think about getting our dwell time to be our average length of staff, and we will be saving our patients from needless restarts
- 5907 catheters in randomized, multi-center study
  - Clinical indication (1593 patients) – average 99 hours
  - Routine rotation (1690 patients) – average 70 hours


2011 CDC Guidelines

Intended to provide evidence-based recommendations for preventing intravascular catheter-related infections

5 major areas of emphasis:
1. Education of healthcare professionals
2. Use maximal sterile precautions (MSP)
3. Use ≥ 0.5% CHG skin prep
4. Avoiding routine replacement of CV catheters as a strategy to prevent infections
5. Use antiseptic/antibiotic impregnated catheters and CHG impregnated sponge dressing (If rate of infection not decreasing despite adherence to above 4 strategies)

Targets elimination of CRBSI from all patient-care areas

CHG impregnated sponge dressings received a Category 1B recommendation for reducing the risk of CLABSIs

- "strongly recommended for implementation and supported by some experimental, clinical, or epidemiologic studies and a strong theoretical rationale"
- CHG impregnated sponge dressings are the only form of CHG dressing recommended in new CDC guidelines
  - "No recommendation is made for other types of chlorhexidine dressings (Unresolved Issue)"

CHG impregnated sponge dressings received a Category 1B recommendation for reducing the risk of CLABSIs

- "The nurse should consider replacement of the short peripheral catheter when clinically indicated and when infusion treatment does not include peripheral parenteral nutrition."
- "If a catheter-related bloodstream infection is suspected, consideration should be given to culturing the catheter after removal."
- "Routine site care and dressing changes are not performed on short peripheral catheters unless the dressing is soiled or no longer intact."

The Origin of Microorganisms Causing CRBSI

- Contaminated Infusate: <1%
- Contaminated Catheter Hub: 12%
- Skin Organism: 60%
- Unknown: 28%

Protected Clinical Indication

- What are you doing for the PIVs that are staying in longer than 72 hours to reduce skin colonization?

- A product exists that can help reduce the skin flora if you are leaving your catheters in for longer periods of time (up to 7 days at a time)

Evidence you should ask for

- Cleared Indication for Reduction of CRBSI
- Highest Level of Evidence/ Studies
- National Guideline Recommendations

Building a Business Case

- Ward approach (Health Finance Manage. 2006 Dec;60(12):92-8.)
- Cost
  - $60,233/year = $2.07/CVC-patient/day

CLABSI

- Baseline 1.4/1,000 = 41 CLABSI/year expected
- 52% reduction = 21 fewer CLABSI
  - 20% mortality = 4 fewer deaths

LOS

- ALOS/CLABSI = 2.7 days = 56.7 days prevented
- Avg. LOS at Hospital X = 4.5 days = 13 new/additional admissions
Clinical Indication: Key Considerations

- Staff competency & assessment expectations
- Skin prep & no touch technique
- Optimal Placement to allow dwell time
- Protect the site from bacterial recolonization
- Meticulous hub hygiene
- Catheter securement
- Defining when the catheter must come out
- Surveillance – who will monitor outcomes?

Resources, Implementation Tools & Educational Support

To make a large impact, make a small change to the most frequently performed invasive procedure in your institution.
Thank you!