IMPROVING TRAINEE KNOWLEDGE OF CENTRAL VENOUS CATHETERS TO IMPROVE PATIENT SAFETY
AUTHORS

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BACKGROUND

• High volume of Interventional Radiology vascular access procedures for a 722 bed academic hospital.

• There are many risks, contraindications and complications associated with central venous catheter usage.

• There is lack of standardization of management algorithms.
PURPOSE

- Gauge resident knowledge and comfort level with central venous catheters.

- Develop an education curriculum to improve central venous catheter management.

- Standardize catheter management within the Interventional Radiology division.
MATERIALS & METHODS

• We administered a 25 question online questionnaire to obtain baseline information including:
  • Basic knowledge
  • Comfort level in dealing with hospital catheters
  • Indications
  • Contraindications
  • Peri-procedural details
  • Post placement management
MATERIALS & METHODS

• Surveyed PGY 1 through PGY 6 residents including programs with highest exposure to catheter usage such as:
  • Radiology
  • General Surgery
  • Internal Medicine
  • Emergency Medicine

• We determined strengths and weakness of the residents based on survey results.
EDUCATION IMPLEMENTATION

- Direct Conference Learning: Presentation by interventional radiology residents including question and answer segment.

- Power Point Presentation: Emailed to all residents for home learning and easy to access hospital guidelines.

- Hospital Poster: Pictorial outline of each catheter used in the hospital including contraindications, management, and indications.
EDUCATION IMPLEMENTATION

- Hospital Educational Posters
- Direct Conference Learning
- Power point education
Teacher University Hospital Central Venous Catheter Overview

Nontunneled Central Venous Catheters
Peripheral Inserted Central Catheter (PICC) or Midline Catheter

- Entry site: Basilic > Brachial > Cephalic
- Duration: >2 weeks
- Major Indications:
  - IV access required for >2 weeks
  - Immune-suppressant medications, long-term IV antibiotics, TPN, Chemotherapy
- Absolute contraindications:
  - Evidence of systemic infection
  - Creatinine >3 mg/dl, and/or renal transplants
- Relative contraindications:
  - Central IV access >2 weeks
  - Elevated WBC (unless patient is albinism, blood cultures are negative, and WBC is trending down)
  - Upper arm venous occlusion or deep venous thrombosis
  - Prior lymph node dissection. Can be placed in contralateral arm.

Tunneled Central Venous Catheters
Implantable Vascular Access Device (Port)

- Entry site: Jugular, Subclavian, Femoral
- Duration: >3 months
- Indication:
  - Significantly longer access than PICC
  - IV needs that exceed a PICC

- Contraindications:
  - Systemic infection
  - Coagulopathy (INR >1.5)

Hickman Catheter
Similar to Groshong and Boviak catheters

- Entry site: Jugular > Femoral
- Duration: Indefinite
- Indication:
  - ESRD, Stem cell transplant
- Contraindication:
  - Systemic infection
  - Coagulopathy (INR >1.5)

Triple Lumen Catheter

- Entry site: Jugular > Femoral > Subclavian
- Duration: <2 weeks
- Indication:
  - Failed attempts at peripheral IV
  - Unsuccessfully attempted bedside central line
  - High-risk central line: Coagulopathy, Body habitus, Infection

Tunneled Dialysis/Plasmapheresis Catheter

- Entry site: Jugular > Femoral
- Duration: Indefinite
- Indication:
  - ESRD, Stem cell transplant
- Contraindication:
  - Systemic infection
  - Coagulopathy (INR >1.5)

Tunneled PICC

- Entry site: Jugular > Femoral
- Duration: 12 weeks
- Indication:
  - Patients with ESRD requiring hemodialysis

Other Information
- Ceramic cuff: Hickman and tunneled dialysis catheters. Lies within the subcutaneous tunnel, where tissue granulates into the cuff, thus effectively anchoring the catheter and acting as a barrier for preventing the spread of organisms along the catheter.
- Pre-procedural antibiotics: Used for port placement and tunnel catheter exchange.
- Ideal tip location: proximal 1/3 right atrium for dialysis catheters and ports, caval-vein junction for other catheters.
- Malfunctioning: Obese x-ray should be the first study ordered for positioning.
RESULTS

Test Results

Pretest | Posttest
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Graph showing the test results with Pretest values less than Posttest values.
## RESULTS

<table>
<thead>
<tr>
<th></th>
<th>Pre test</th>
<th>Post Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample Size</td>
<td>30</td>
<td>37</td>
</tr>
<tr>
<td>Average</td>
<td>55%</td>
<td>73%</td>
</tr>
<tr>
<td>Range</td>
<td>35-79%</td>
<td>27-92%</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>11%</td>
<td>13%</td>
</tr>
</tbody>
</table>
CONCLUSION

1. We developed an interdisciplinary educational format, which is being initiated in several other hospital quality improvement projects.

2. Test results displayed improvement in resident knowledge.

3. While not yet studied at our institution, we believe an increase in resident knowledge will reflect an improvement in patient safety and care.

4. Better workflow in the interventional radiology department at our institution.
FUTURE DIRECTION

• Assess for long term improvement in resident knowledge.
• Assess for improvement in catheter related patient safety outcomes.
• Update educational information based on continued resident feedback and changes in national guidelines.
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