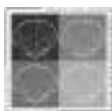


Technology & Clinical:

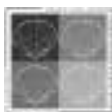


Techniques and Technologies for
Obtaining Optimal PICC Outcomes

Robert Ferdinand, BSN, RN, CRNI®
IV / PICC Nurse
Massachusetts General Hospital
Boston, MA

Connections to Success Building Alliances

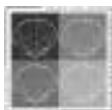
Outline



- Optimal PICC Tip Locations
- Types of Malpositions/Examples
- Techniques for Prevention
- Available Technologies
- Data Collection & Analysis
- Database Utilization
- What's on the Horizon...

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Objectives

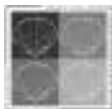


At the end of the presentation, the learner
will be able to:

- Identify the optimal tip locations for PICCs
- Discuss common causes of catheter malpositioning
- Describe techniques that can reduce malpositioning
- Describe technologies that can reduce malposition rates and optimize patient outcomes
- Recognize the value of tracking outcomes that facilitate evidence-based practice

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What Is the Optimal PICC Tip Location?



Infusion Nurses Society

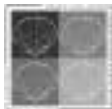
2006 Infusion Nursing Standards of Practice

- Standard 42.4

“Central vascular access devices shall have the distal tip dwelling in the lower one third of the superior vena cava to the junction of the superior vena cava and the right atrium.”

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What Is the Optimal PICC Tip Location? (Continued...)



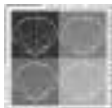
Association for Vascular Access

1998 Position Paper

- ***“Recommends that the most appropriate location for the tip of peripherally inserted central catheters (PICCs) is the lower one-third of the superior vena cava (SVC), close to the junction of the SVC and the right atrium.”***

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What Is the Optimal PICC Tip Location? (Continued...)



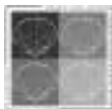
Food and Drug Administration (FDA)

1997 Premarket Notification [510(k)] review requirements for short- and long-term intravascular catheters.

- ***“Central Venous Catheter (CVC) - Tubular device, catheter, or cannula, placed within a vein and whose distal end is intended to be located within the vena cava (inferior or superior).”***

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What Is the Optimal PICC Tip Location? (Continued...)

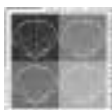


The American Society of Parenteral and Enteral Nutrition (ASPEN)

“Recommends that parenteral nutrition be administered through a central venous catheter (CVC) with tip placement in the superior vena cava adjacent to the right atrium.”

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Examples of Malpositioned PICCs



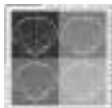
- Right Atrium
- Right Ventricle

May result in:

- Dysrhythmias (PACs, PVCs, etc.)
- Myocardial erosion
- Pericardial effusion
- Cardiac tamponade
- Other...

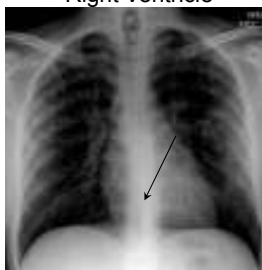
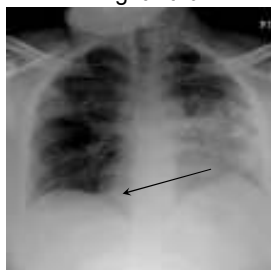
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What Does This Look Like on a Chest Film?



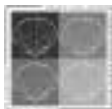
Right Atrium

Right Ventricle



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Examples of Malpositioned PICCs (Continued...)



- Subclavian vein
- Brachiocephalic vein
- Jugular vein
- Contralateral
- Coiled / looped
- Azygos vein

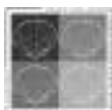
And more...

Increased risk of:

- > Phlebitis
- > Thrombosis
- > Pleural Effusion
- > Infections

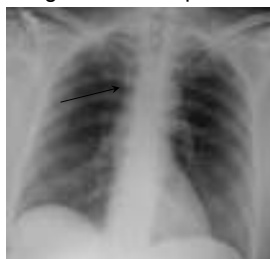
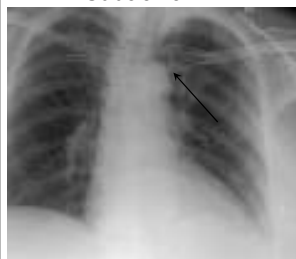
Connections to Success Building Alliances

What Does This Look Like on a Chest Film?



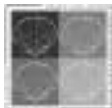
Subclavian

Right Brachiocephalic



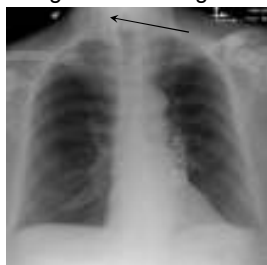
Connections to Success Building Alliances

What Does This Look Like on a Chest Film?



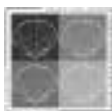
Right Internal Jugular

Contralateral

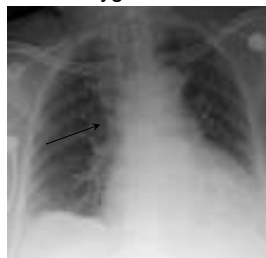


Connections to Success Building Alliances

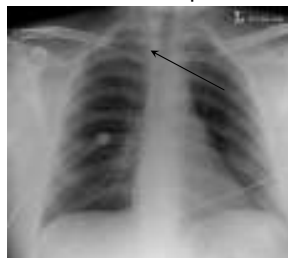
What Does This Look Like on a Chest Film?



Azygos Vein

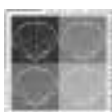


Coiled / Looped



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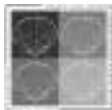
Why Does This Happen?



- Inaccurate measurements
- Patient unable to turn head & tuck chin
- Tortuous veins
- Venous system idiosyncrasies
- Others...

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What Do We Do to Resolve Malpositions?



Right atrium & right ventricle:

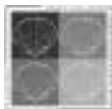
- Pull back

All other malpositions:

- Over-the-wire catheter exchange
OR
- Refer to vascular radiology to reposition or exchange catheter under fluoroscopy

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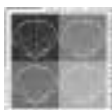
What Are the Consequences?



- Delays in patient's IV therapy
- Increase in length of stay
- Increased risk of thrombophlebitis
- Increased risk of infection
- Decrease in IV team productivity

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"Tricks of the Trade" to Minimize Malpositioning...

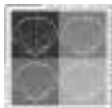


- Ask patient if they hear a "swishing" sound in their ears while flushing the catheter
- Use the U/S probe to scan the neck after placement
- Auscultate the neck while flushing catheter

This only addresses jugular placement!
What about other malpositions?

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MGH IV Dept. Outcome Management: How Often Did This Happen?

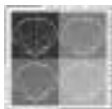


Problems Identified:

- Enormous amount of paper documentation.
- Tedious efforts to track, calculate, and report on data.
- Challenging to maintain quality assurance and target areas for quality improvement.
- Recommended practice changes tended to be more anecdotal instead of raw data.

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Outcome Management (Continued...)



Idea:

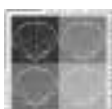
- Use an electronic database

Barrier:

- Cost of paying a database developer to design a custom application for data management averages \$110-150+ per hour.
- A robust database application averages 500+ hours of time to develop = \$55,000 - \$75,000+.

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Outcome Management (Continued...)



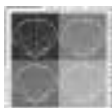
Solution:

Design our own database application to:

- Replace paper documentation records
- Have a centralized electronic documentation system
- Facilitate seamless data entry and retrieval
- Maintain quality assurance
- Recognize patterns
- Target areas for quality improvement
- Real-time reporting
- Facilitate evidence-based practice, support practice changes, and optimize patient outcomes

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Database Development



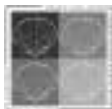
- I built a PICC database in Microsoft Access
- Over 1,000 hours invested

Setback:

- I.S. dept. reluctant to get involved
- Did not want it added to our Partners application menu
- Used database only in our office

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Database Development

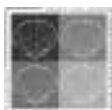


Through Perseverance...

- The database was added to our Partners application menu in July 2009, which allowed it to be accessible from any computer throughout the hospital.

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How Often Does This Happen?

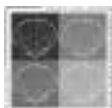


Results from the database:

- 652 successful PICC insertions
- 63 malpositioned tips (excludes right atrium)
- Baseline Rate = **9.66%**
- Using only our "tricks of the trade"

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Can We Improve This?

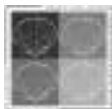


YES, WE CAN...

- Standardize measurement techniques
- Tip locator technology

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Tip Locator Trial

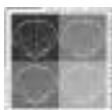


Results from the database:

- 1364 successful PICC insertions
- 60 malpositioned tips (excludes right atrium)
- New rate = **4.40%**
- Using the Sherlock tip locator
- 5.26% reduction or 72 less malpositions

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Tip Locator Trial (continued...)

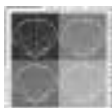


Fiscal impact of having a tip locator:

- 72 less malpositions in 4-month period
- Average cost for each = \$248+
- 4-month cost savings = \$17,856+
- End result= Decreased delays in patients' IV therapy, cost containment, increased productivity, and evidence-based practice.

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Just the tip of the iceberg

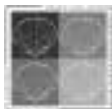


What else does our database track?

- Consult data
- Insertion data
- Tip location / intervention data
- Care and maintenance
- Complications
- Occlusions
- Removal
- Also tracks outside hospital / Vas Rad catheters

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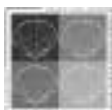
The MGH PICC Database: Reporting



- Volume reports
- Complication reports
- Procedural reports
- Product-related reports
- Lot # recall reports
- Employee reports
- And more...

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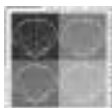
Currently in Progress...



- PICC database is in the process of being deployed at other Partners hospitals.
- MGH is currently working with the ANA and the NDNQI® to make this database platform a national repository for PICC information.

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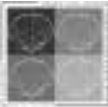
Imagine this...



- You can benchmark yourself against other hospitals.
- Product trial results would be aggregated into one big report.
- Researchers could go to one place to pull their information from...
- Does this sound too farfetched?
- The select few people who have had the opportunity to see our application don't seem to think so...

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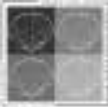
References



- 1) Alexander, M., Corrigan, A., Gorski, L., Hankins, J., & Perucca, R. (2010). *Infusion Nursing: An Evidence-Based Approach* (3rd Edition). St. Louis, MO: Saunders.
- 2) Food and Drug Administration [FDA] (1997). *Guidance on Premarket Notification [510(k)] Submission for Short-Term and Long-Term Intravascular Catheters*. pp. 1-27.
- 3) Furdon, S. & Clark, D. (2003). Assessment of infants with peripherally inserted central catheters: Part 2. Detecting less frequently occurring complications. *Advances in Neonatal Care*, 3(1), pp. 14-26.
- 4) Infusion Nurses Society [INS] (2006). *Infusion nursing standards of practice*. *Journal of Infusion Nursing*, 29(1S), pp. S1 – S92.
- 5) Mirtallo, J., Canada, T., Johnson, D., Kumpf, V., Petersen, C., & Sacks, G. (2004). Safe practices for parenteral nutrition. *Journal of Parenteral and Enteral Nutrition*, 28(6), pp.1-34.

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- 6) National Association of Vascular Access Networks [NAVAN] (1998). Tip location of peripherally inserted central catheters. *Journal of Vascular Access Devices*, pp.1-4.

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Questions???



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