Factors Affecting Tip Placement

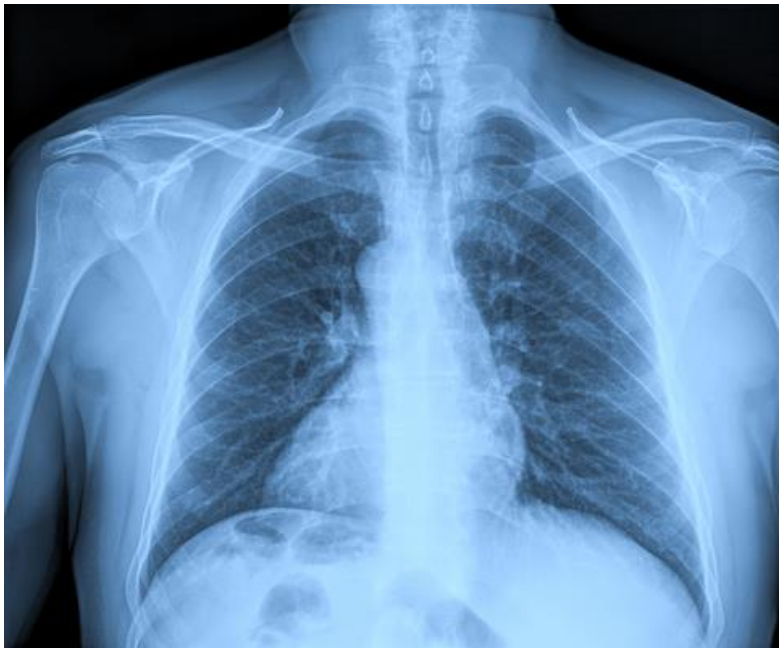
Chest X-ray

Objectives

- Clinician is able to:
  - Identify various landmarks used to identify catheter tip placement
  - Define various factors that contribute to difficulty in reading chest X-rays for catheter tip placement
  - Describe process for correlation between the ARROW® VPS G4™ Device and chest X-ray

Chest X-ray

……..the imperfect tool to solve the malposition problem



Chest X-ray

- Most common tip confirmation system used in the USA
- Performed after placement of CVC but prior to administration of medications
- For best tip confirmation results, obtain anterior/posterior view AND lateral view
- Review of anterior/posterior view ONLY may lead to false sense of security in terminal tip location
- Performed AFTER completion of the insertion procedure requiring expensive set-up if repositioning is necessary

Chest X-ray

- May have delays of 1-8 hours for final report
- Malposition rates for blind insertions can range from 20%-50%[2]
- Referral to Interventional Radiology after bedside placement failure occurs in 2%-5% of placements[2]
- Probability of infection increases by 20% upon each repositioning event[3]

Chest X-ray

- Delay between placement and reading
- Image clarity and quality often poor
- Inherent inaccuracy – use of landmarks
- Interpretation and reading variations
- Radiation exposure

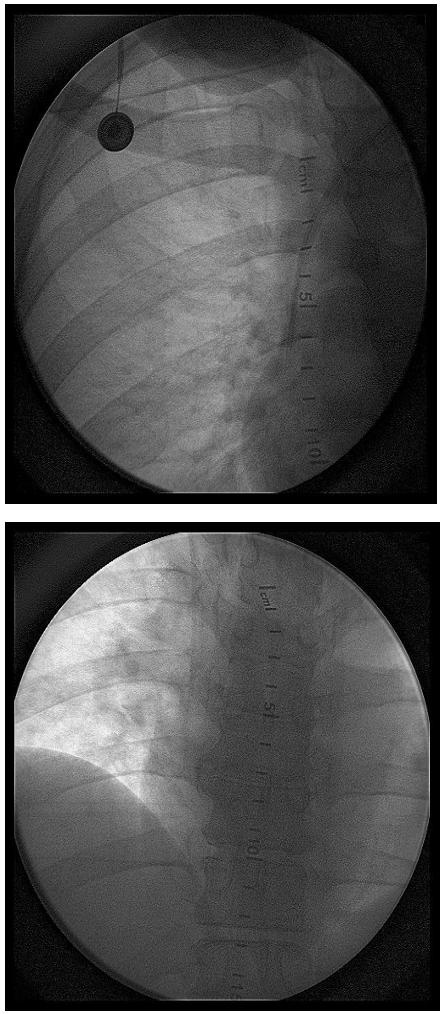


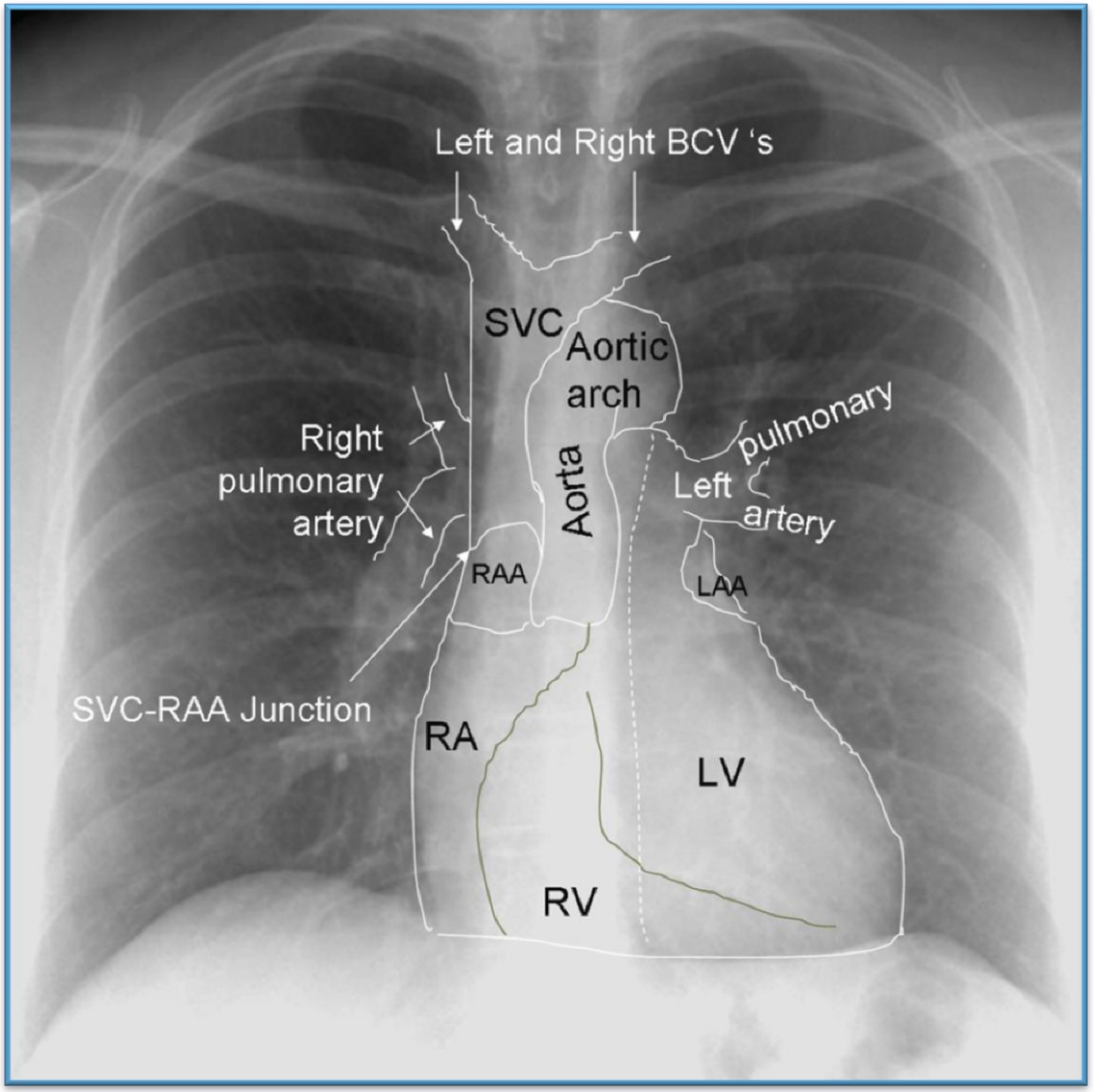
Photo courtesy of Nadine Nakazawa, BS, RN, OCN, CRNI, VA-BC

Chest X-ray

- Major landmarks defined in the majority of the population:
  - SVC-RAA junction to CAJ (1.8 cm, range: 1.0 – 3.0 cm)
  - Carina to CAJ (4.7 cm, range: 2.5 – 7.0 cm)
  - Intercostal spaces (ICS):
    - First and Second: overlie origin of SVC (45% and 55% resp.)
    - Third and Fourth: overlie the CAJ (39% and 52% resp.)

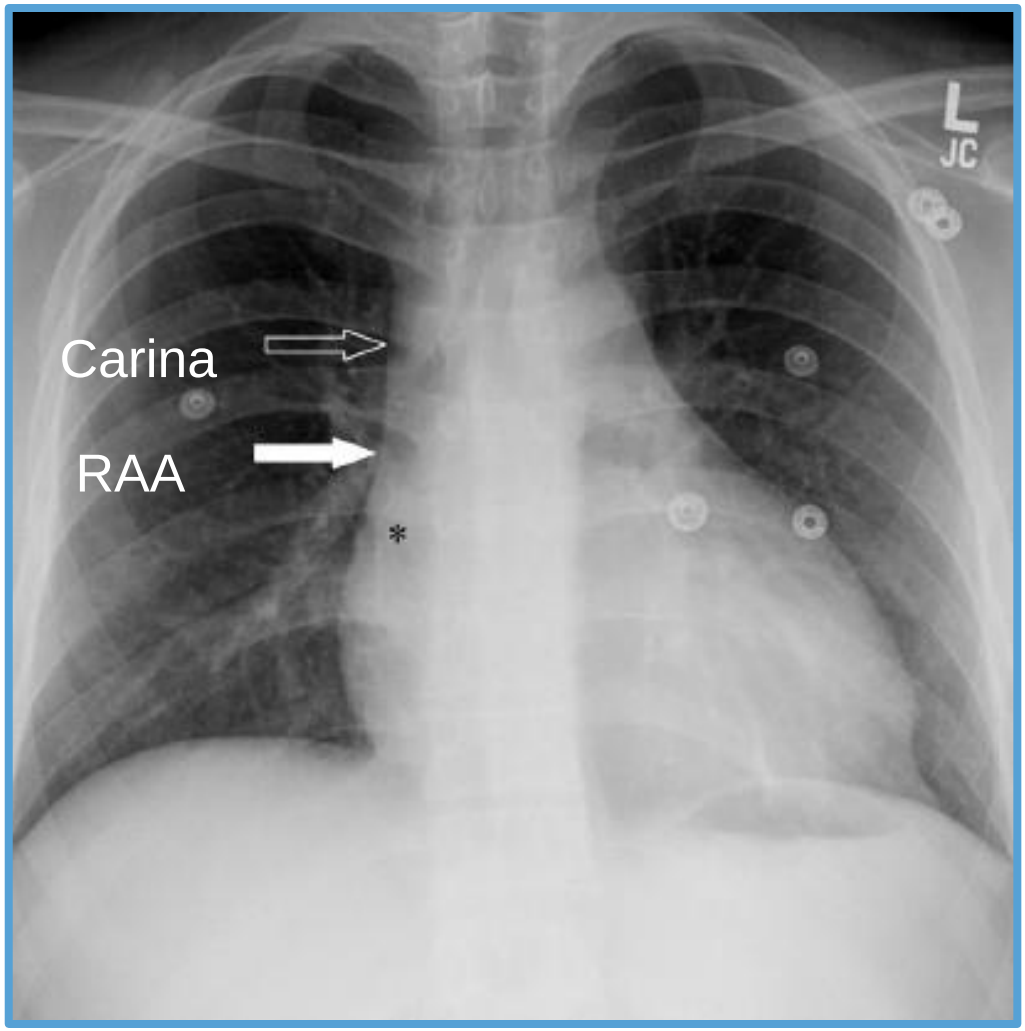
Chest X-ray

What the MD sees



JAVA 2008;13(1), 32-35.

Ideal Radiographic Landmarks



JAVA 2008;13(1), 32-35.

Wet Lungs

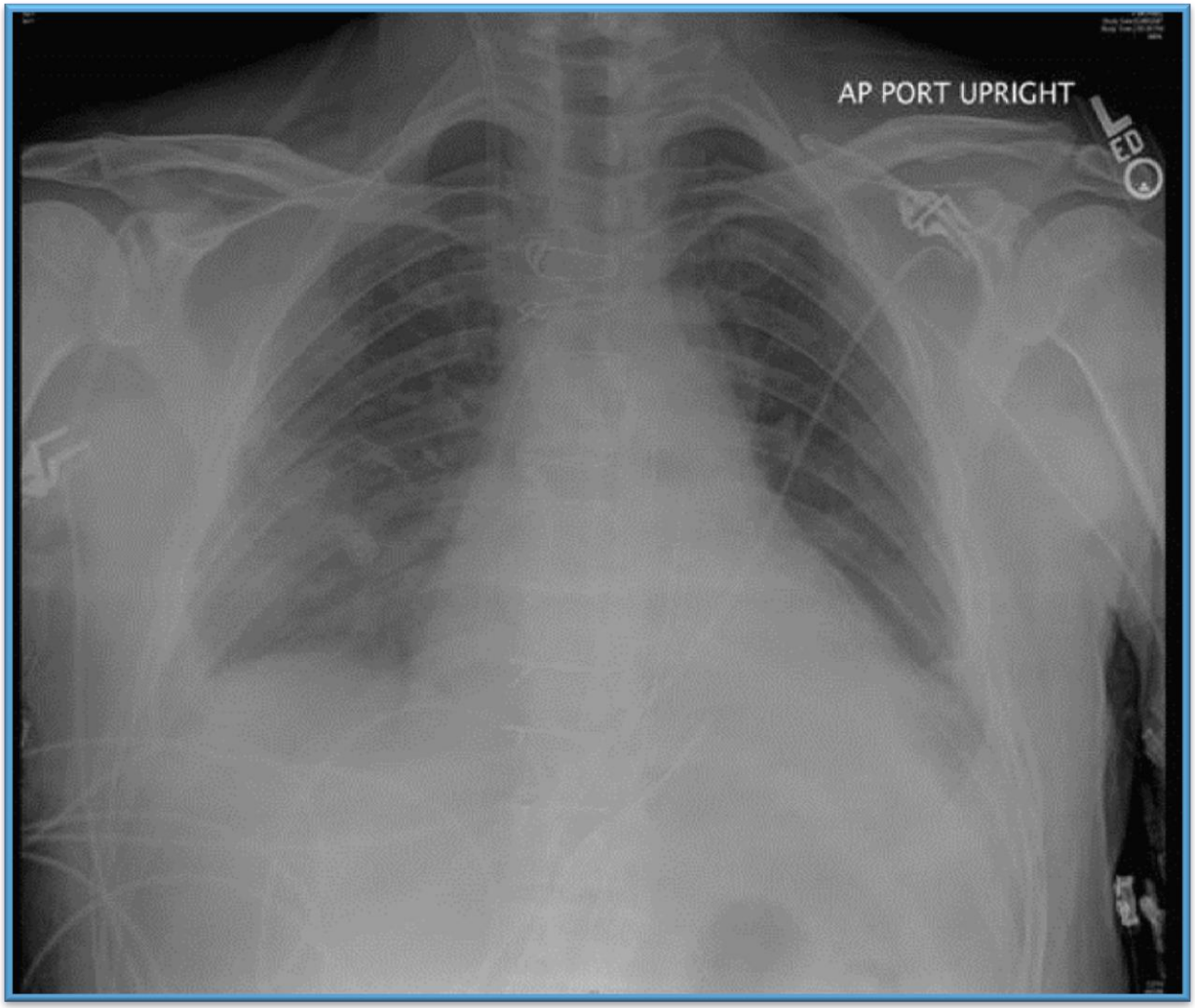


Photo courtesy of Nadine Nakazawa, BS, RN, OCN, CRNI, *VA-BC*

Morbidly Obese

Photo courtesy of Nadine Nakazawa, BS, RN, OCN, CRNI, VA-BC

Morbidly Obese: Portable

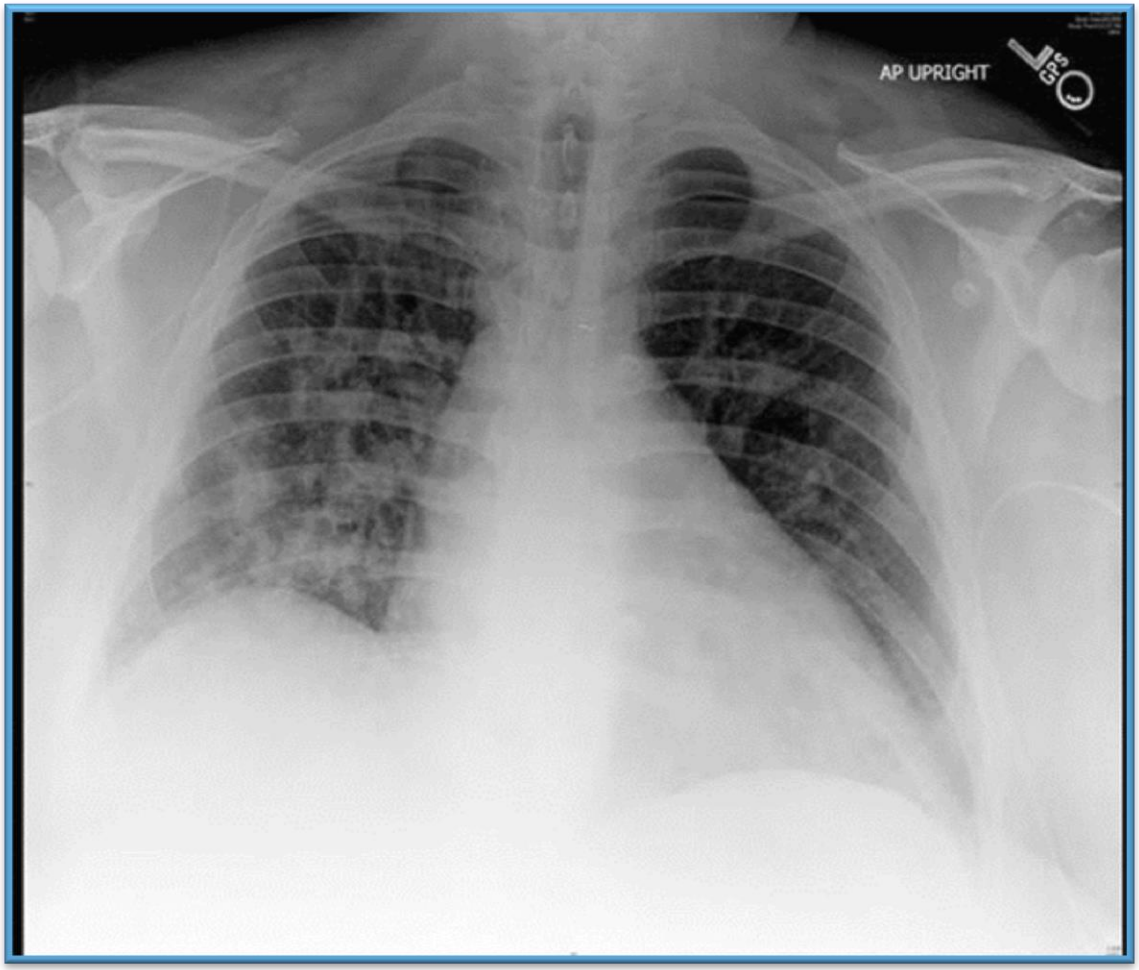


Photo courtesy of Nadine Nakazawa, BS, RN, OCN, CRNI, VA-BC

Tunneled Dialysis CVC and Pacemaker

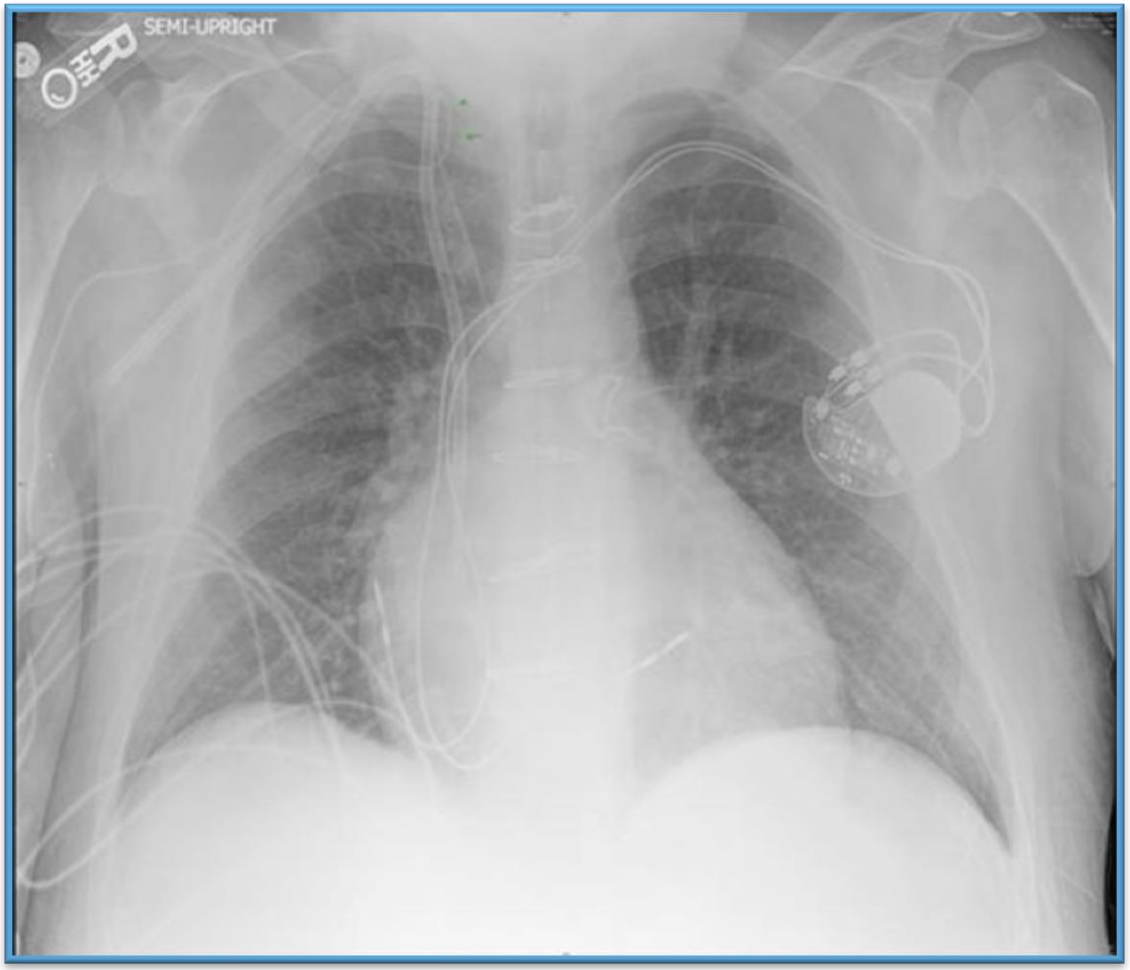


Photo courtesy of Nadine Nakazawa, BS, RN, OCN, CRNI, VA-BC

PICC Obscured by Harrington Rods

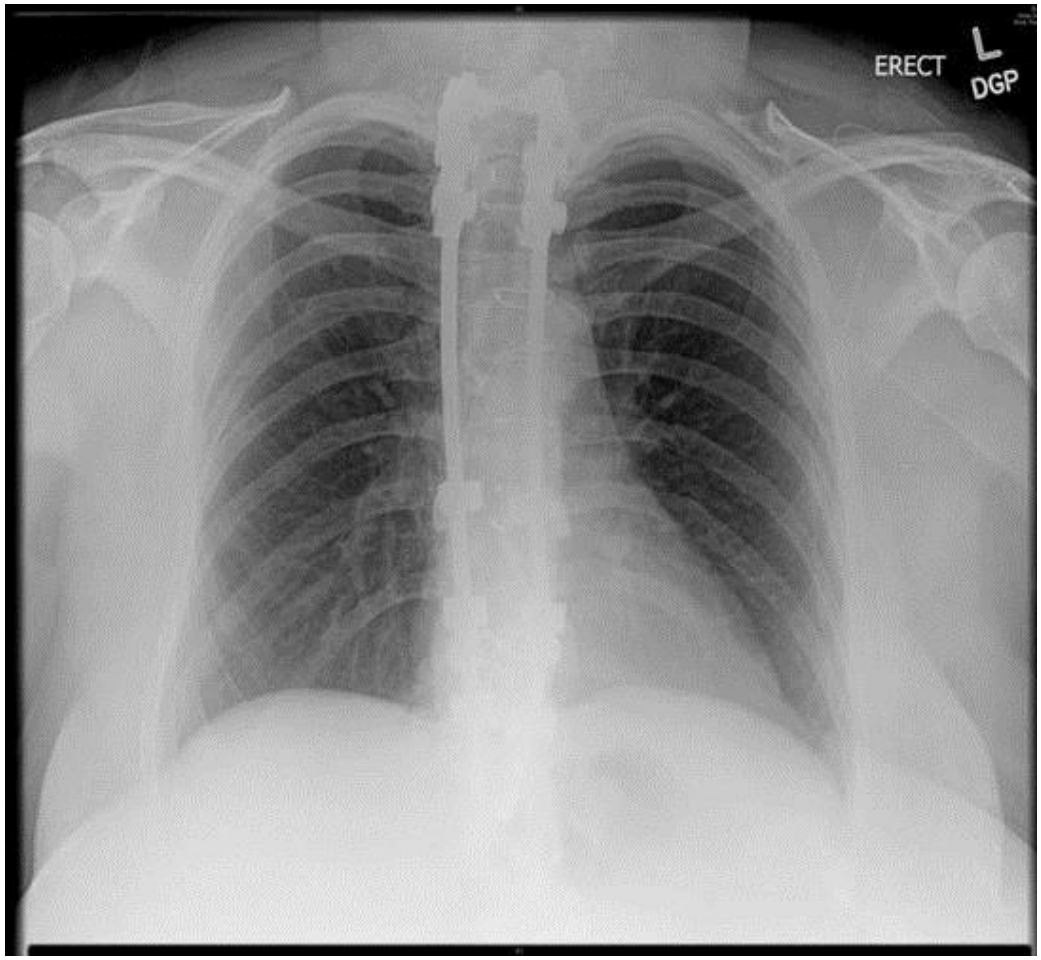


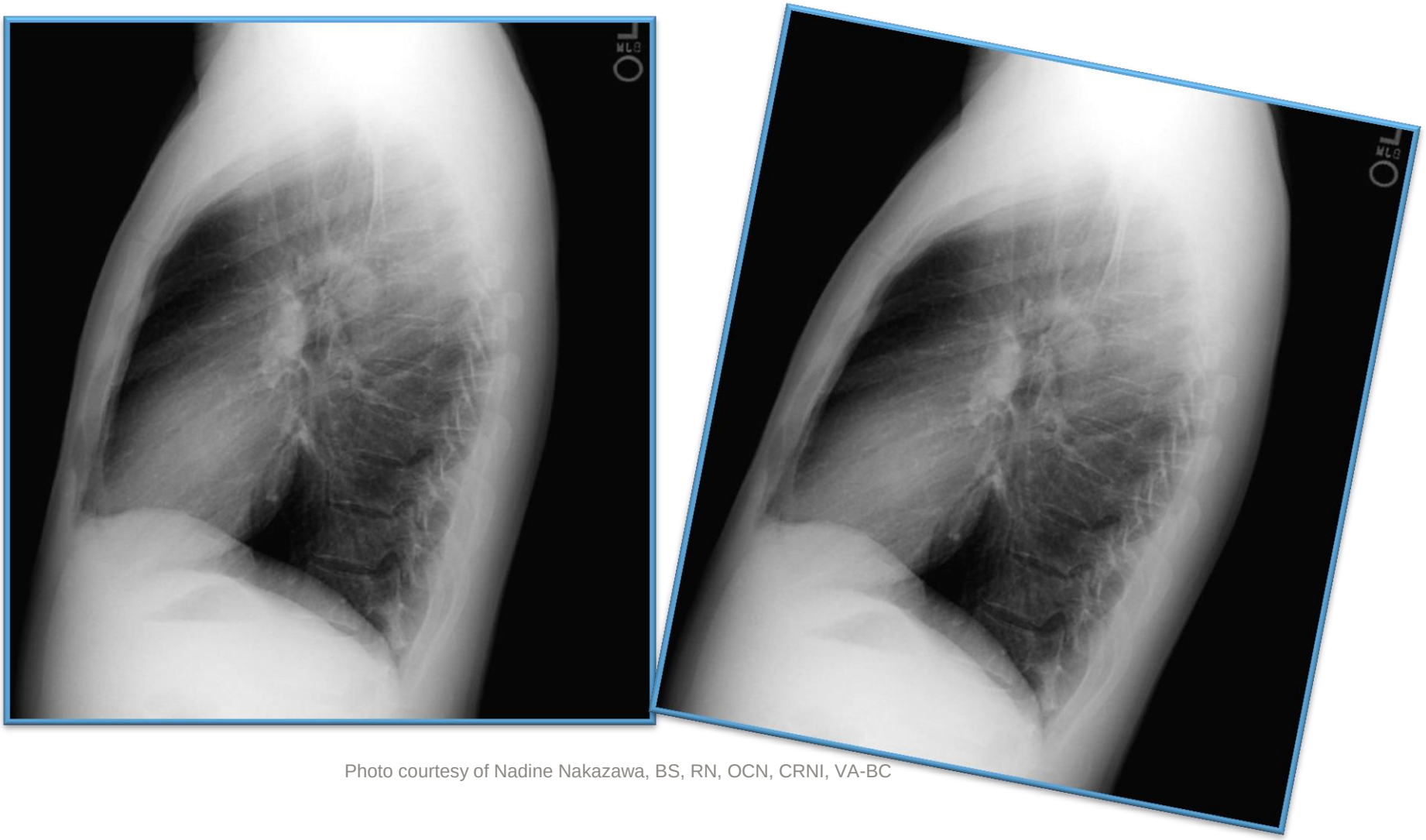
Photo courtesy of Nadine Nakazawa, BS, RN, OCN, CRNI, VA-BC

Factors Affecting Tip Placement

A further limitation of chest X-ray is **parallax**

- Parallax is the apparent shift in the position of an object by a change in the observation position
- The brain subconsciously uses information from both eyes to estimate distances
- The distance estimate requires observation from two points

Parallax



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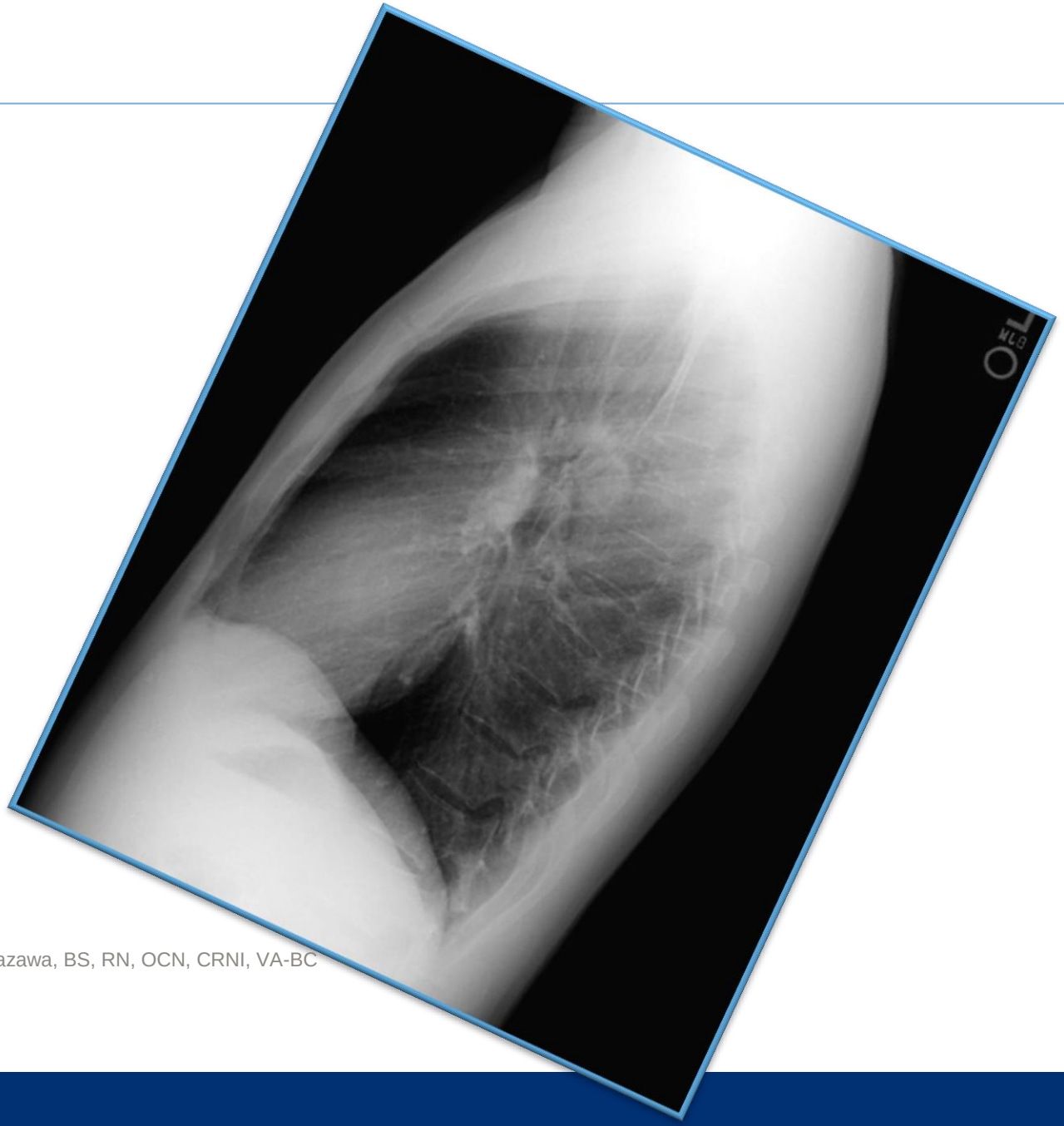
Parallax



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Parallax

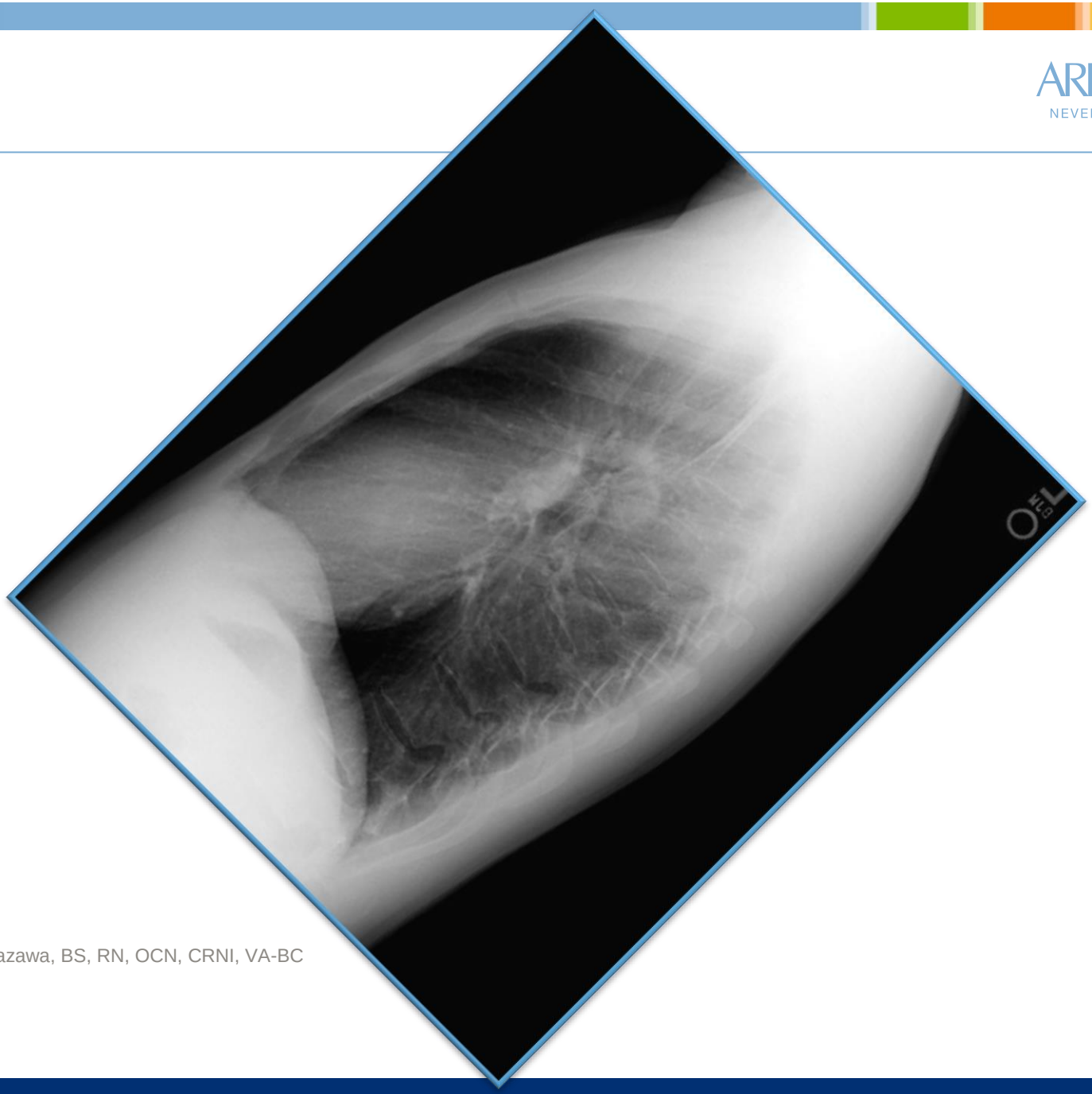

Photo courtesy of Nadine Nakazawa, BS, RN, OCN, CRNI, VA-BC

Tip Confirmatory Chest X-ray: Associated Problems

- Time to read and clear: delays time to therapy
- Reading clarity, specificity and consistency
- Workflow problems for vascular nurses
- Malposition – tip often placed and left outside of the optimal zone
  - Hard to read CXR, projection angle, anatomical variations (parallax)
  - Compromise on what is best for patient – replace or leave it there
- Patients unhappy with procedural repetitions and wait time
- Radiation exposure

Correlation Between Chest X-ray and ARROW® VPS G4™ Device

- Understanding all variables will assist in correlation of ARROW® VPS G4™ Device and chest X-ray readings
- Remove variables if possible
- Include Radiology
- VPS® Device offers first time success rate of positioning in the lower 1/3 SVC-CAJ at >98.4%*

Data on file at Teleflex*