

Outcomes of Chest X-ray De-implementation After Ultrasound Guided Central Venous Catheter Insertion

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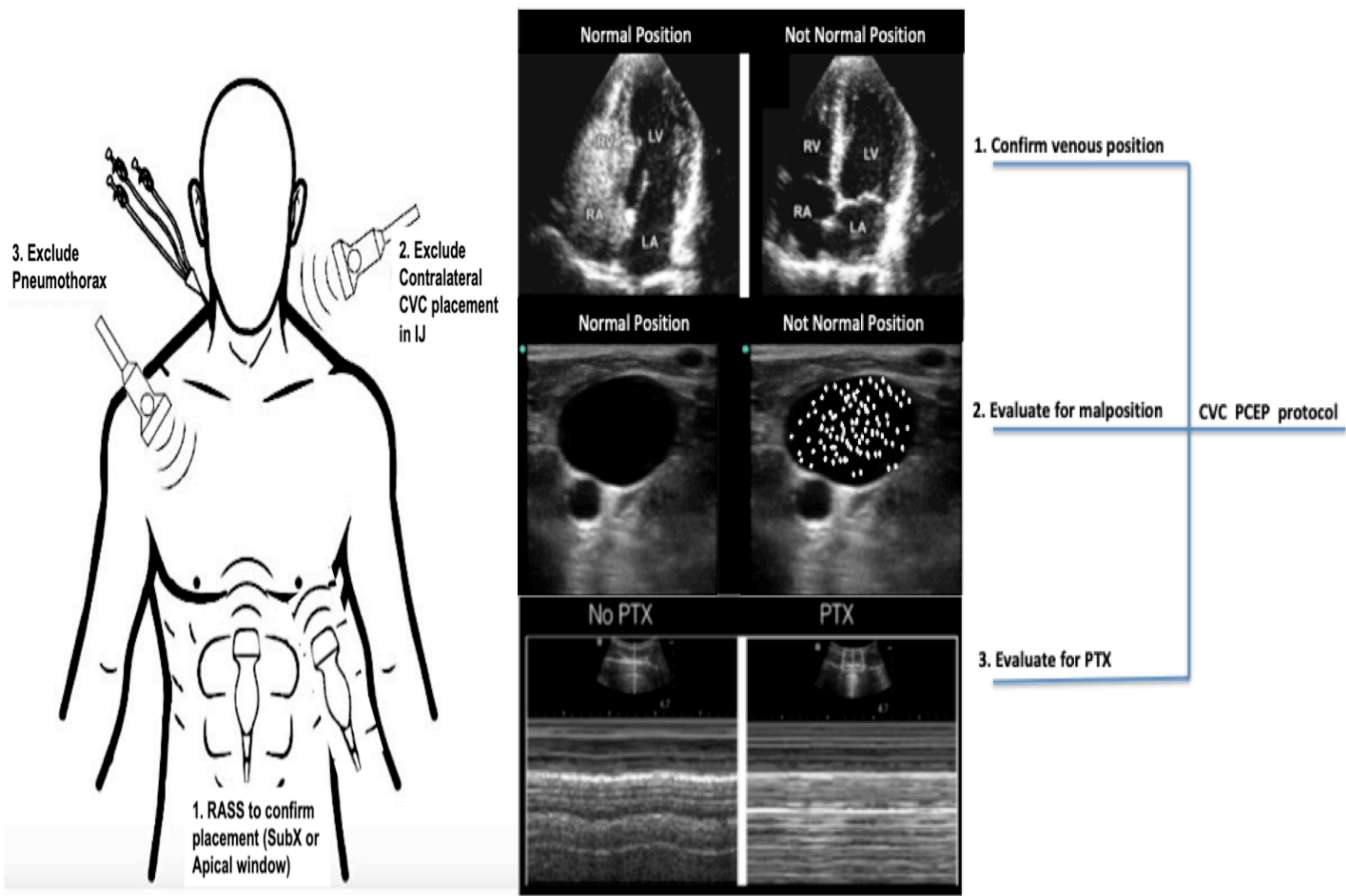
Introduction

Background

- Approximately 5 million central venous catheters (CVCs) are performed annually in the United States
- Standard of care dictates catheter tip position confirmation and exclusion of pneumothorax (PCEP) following CVC placement
- Chest radiography (CXR) is presently the most common means of CVC PCEP
- Ultrasound (POCUS) has emerged as an efficient alternative to CXR for CVC PCEP but is not being used
- This evidence-to-practice gap is primed for an implementation program

Ultrasound Guided CVC PCEP

- A three-step protocol can be used to determine catheter tip position and exclude pneumothorax using POCUS
 - Position confirmation: Saline rapidly injected into the catheter creates a distinct swirl sign that is visible on ultrasound – this can be used to localize the catheter tip position
 - Pneumothorax (PTX) exclusion: Assess for pleural slide



POCUS Advantages

- Similar diagnostic accuracy to CXR but much faster
- Requires no additional equipment or personnel
- Potential workflow improvements since POCUS used to insert CVC

References and Acknowledgements

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DRAUP Program, Objectives, and Methods

De-implementation of Routine CXR after Adoption of Ultrasound guided CVC insertion and confirmation Protocol

Innovative post CVC program in Barnes-Jewish Hospital Emergency Department (began in January 2020 and is ongoing)

- All patients with uncomplicated right internal jugular (RIJ) CVC insertion eligible for DRAUP
- Senior resident and attending physicians trained in DRAUP protocol
- Adoption encouraged but not required

DRAUP protocol:

- Right atrial opacification observed after rapid saline flush
 - No echogenic material seen in left neck vessels after saline flush
 - Right anterior chest pleural movement observed
- If all three criteria are met, the patient does not require a CXR (**DRAUP in**)
 - Patients who fail to meet these criteria are reverted to traditional CXR based confirmation (**DRAUP out**)



Research Objectives

- Track adoption rate of DRAUP protocol
- Measure clinical effectiveness of DRAUP protocol:
 - Detection of clinically significant complications
 - Rate of reversion to CXR
 - Reduction in Emergency Department (ED) CXR including downstream in Intensive Care Unit (ICU)

Methods

- Chart review for all ED CVCs placed in RIJ over 7 months
- Data points for interim analysis include:
 - Confirmation method
 - Success of DRAUP protocol (DRAUP in vs DRAUP out)
 - Presence of complications (catheter malposition & PTX)
 - Timing and location of first CXR after CVC insertion

Results and Conclusions

Results

Adoption

- 86 RIJ catheters placed during 7-month period in ED (of 252 total CVCs)
- 43/86 (50%) used DRAUP protocol

Post-DRAUP CXR Usage

- 35/43 (81%) of DRAUP patients did not receive ED CXR post-CVC placement (DRAUP in)
- 28/35 (80%) of DRAUP-in group still did not receive CXR within 2 hours of ICU admission
- 8/43 (19%) DRAUP attempts were reverted to CXR (DRAUP out)

Sensitivity and Specificity

- 3/43 (7%) DRAUP and 2/43 (5%) non-DRAUP patients had catheter malposition (100% venous)
- Of 5 total malpositions observed, 1 removed within 24 hours; 4 clinically used without repositioning
- POCUS sensitivity for catheter malposition: 0.67
- POCUS specificity for catheter malposition: 0.78
- No iatrogenic pneumothoracies, arterial malpositions, or retained wires observed

Conclusions

- Ultrasound guided CVC confirmation can be used in Rt IJ insertions instead of CXR
- DRAUP protocol adoption is associated with decreased CXR usage
- Mechanical complication rates between DRAUP and non-DRAUP patients are low and comparable

