Revised: Version 1.1 October 18, 2018
Reviewed by Residency Program Committee: September 9, 2026
Next Review Date: September 2027

Division of Nephrology Training Policy

for Central Venous Catheter Insertion

Table of Contents

Introduction **2**

Training Requirements **2**

- **Simulation Training** **2**
- **Evaluation** **3**
- **Bedside Training** **3**
- **Independent Practice** **4**

References **5**

Appendix A **6**

Appendix B **7**

Introduction

Insertion of a temporary central venous catheter (CVC) is an essential component in the administration of emergency hemodialysis. The process of CVC insertion has evolved significantly over the past decade, from a blind procedure to an ultrasound marked procedure to the current practice of real-time ultrasound guidance.

The safety benefits of real-time ultrasound guidance are well established for central venous access in general,[1-3] and for temporary hemodialysis CVC placement.[4] In addition, compared to blind techniques, real-time ultrasound guidance results in faster internal jugular and femoral vein line placement, an important consideration in the setting of emergency hemodialysis.[5,6] Despite these benefits, real-time ultrasound guidance is not a magic bullet. The skill and experience of the operator still matter and a failure to understand the limitations of ultrasound can increase the likelihood of complications such as back-wall puncture.

This policy statement will detail the requirements for CVC insertion training with the goals of minimizing complications related to CVC insertion, and eliminating complications arising from known technical issues, by formalizing standards for training and supervision. This document will not address the technical aspects of CVC insertion, which are detailed in Division of Nephrology Standards on Insertion of Central Venous Catheters, Version 2.1.

Training Requirements

Background Knowledge

All trainees will read the current version of the Division of Nephrology Standards on Insertion of Central Venous Catheters prior to beginning hands-on training (both simulation and bedside training). Experiences in the PGY 1-3 years in CVC insertion are variable. This manual will serve as the first step towards harmonization of previous learning and experiences with our standards for CVC insertion.

Simulation Training

All trainees entering the fellowship program will complete the hemodialysis CVC insertion course. This course will be conducted as early in the fellowship as possible and will consist of three components:

- **Didactic CVC insertion instruction.** Essential components of the Division of Nephrology Standards on Insertion of Central Venous Catheters will be discussed and questions arising from this manual will be answered.

- **Sterile technique.** Standards of sterile technique will be demonstrated and practiced, including sterile gowning and gloving, preparation of the work surface, and sterilization and draping of the target vessel site.

- **Ultrasound---guided vessel cannulation.** Trainees will be instructed in set up of the ultrasound equipment, ultrasound assessment of the target vessel and cannulation of vessels using the "tip-control" technique. Trainees will practice vessel assessment on standardized patients and cannulation using gel-form models.

Evaluation

Trainees will be evaluated on their performance during the simulation training (see Evaluation Form, Appendix A). Those who do not achieve a perfect score will be identified for further, one-on-one instruction before they are allowed to participate in bedside training.

Bedside Training

Trainees who successfully complete Simulation Training will participate in Bedside Training during which they will observe and participate in the insertion of a CVC along with an experienced operator. An experienced operator is a senior fellow (at least PGY5) who has inserted at least thirty hemodialysis CVCs or a consultant nephrologist who is capable of performing CVC insertion.

- **CVC insertions number 1 through 3.** During the trainee's first three hemodialysis CVC insertions, at least one experienced operator must also be in sterile gloves and gown so that they can readily take control of the insertion. For the first three CVC insertions, if a senior fellow is assisting, a consultant nephrologist must also be present.
- **CVC insertions number 4 through 10.** During the subsequent 7 hemodialysis CVC insertions, the trainee must be observed by an experienced operator, but the observer may choose not to be in sterile gloves and gown. However, these insertions must still be observed from beginning to end.
- **Debriefing.** After each of the first 10 CVC insertions, the experienced operator will debrief with the trainee and discuss any problems encountered with the CVC insertion.
- **Tracking Progress.** After each of the first 10 CVC insertions, the experienced operator will email their evaluation of the insertion to the appropriate CVC site leads (University Hospital: Matthew Weir, Victoria Hospital: Nabil Sultan). Sample email evaluations are shown in Appendix B.

Independent Practice

Once the trainee has conducted 10 CVC insertions, the site leads will assess their performance and determine if further training is required or if the trainee is capable of inserting CVCs independently.

Ongoing Supervision and Support

The variables that can offer challenges to CVC insertion are numerous. As such, skill development in CVC insertion is a career-long process; therefore, trainees capable of independent practice and experienced operators alike will need to ask for assistance sometimes. Assistance can take the form of an independent trainee calling a senior fellow, a senior fellow calling a consultant or a consultant calling another consultant or interventional radiology. While all the pathways to assistance cannot be described here, in general, the consultant nephrologist will always be available to assist a trainee with CVC insertion. That assistance can involve directly assisting, or if indicated, seeking the assistance of a colleague or interventional radiology.

Anyone inserting a CVC will seek assistance in the following circumstances:

- **Challenging clinical features.** Any time a trainee feels the patient's body habitus, coagulation status or other feature is presenting a challenge to their skill set, they will call for supervision and/or assistance.
- **Challenging anatomy.** Patients with anomalous vasculature or the need for less common lines (e.g. subclavian lines) should prompt a call for supervision and/or assistance.
- **Multiple attempts.** If more than three attempts are made to access a vessel, the risk of complications increases 6-fold.[7] Therefore, after three unsuccessful, invasive attempts, the trainee will call for supervision and/or assistance. "Invasive attempts" include passes with the introducer needle, attempts to insert the wire, or attempts to dilate the tract.
- **Discomfort with the situation.** It is impossible to describe all the circumstances in which assistance is needed. Instead, anyone attempting to insert a CVC will call for supervision and/or assistance if they feel uncomfortable with the procedure.

References

1. Lalu MM, Fayad A, Ahmed O, et al. Ultrasound-Guided Subclavian Vein Catheterization: A Systematic Review and Meta-Analysis. Critical Care Medicine 2015;43(7):1498–507.

2. Byon H-J, Lee G-W, Lee JH, et al. Comparison between ultrasound-guided supraclavicular and infraclavicular approaches for subclavian venous catheterization in children--a randomized trial. Br J Anaesth 2013;111(5):788–92.

3. Hind D, Calvert N, McWilliams R, et al. Ultrasonic locating devices for central venous cannulation: meta-analysis. BMJ 2003;327(7411):361–0.

4. Rabindranath KS, Kumar E, Shail R, Vaux E. Use of real-time ultrasound guidance for the placement of hemodialysis catheters: a systematic review and meta-analysis of randomized controlled trials. American Journal of Kidney diseases : the official journal of the National Kidney Foundation 2011;58(6):964–70.

5. Bruzoni M, Slater BJ, Wall J, St Peter SD, Dutta S. A prospective randomized trial of ultrasound- vs landmark-guided central venous access in the pediatric population. J Am Coll Surg 2013;216(5):939–43.

6. Aouad MT, Kanazi GE, Abdallah FW, et al. Femoral vein cannulation performed by residents: a comparison between ultrasound-guided and landmark technique in infants and children undergoing cardiac surgery. Anesth Analg 2010;111(3):724–8.

7. Britt RC, Novosel TJ, Britt LD, Sullivan M. The impact of central line simulation before the ICU experience. Am J Surg 2009;197(4):533–6.

Appendix A

Simulation Training Evaluation Form

TECHINQUE	YES	NO
Sterile Technique		
Demonstrates sterile gowning (gown, face shield, hair)		
Demonstrates sterile gloving		
Understands skin cleansing		
Understands creation of sterile field		
Vessel Evaluation		
Demonstrates assessment of IJ (compresses, maps, carotid ID)		
Demonstrates assessment of femoral (compresses, maps, artery ID)		
Cannulation		
Selection of target site (aligned target, image, needle)		
Good angle of approach		
Demonstrates Tip Control technique		
Demonstrates negative pressure needle technique		
Demonstrates wire placement assessment		
Safe to begin bedside training?		

Appendix B

Bedside Training Evaluation Emails.

Emails should be brief, but include important information including the following:

1. The vessel cannulated
2. How many attempts
3. Complications encountered
4. A general sense of how things went (if needed)

Sample Emails

“Inserted right IJ without difficulty”

“Inserted right IJ. Required two attempts to cannulate vessel.”

“Inserted left IJ. Problems threading the wire but got it after the second attempt.”

“Difficulty with a left femoral. Couldn’t cannulate so I had to take over. Did the rest of the
line well. Might need more practice with the ultrasound.”

“Inserted a right femoral. Took multiple attempts to cannulate but the body habitus made things very difficult. Did very well considering the circumstances.

“Tried a right IJ but had lots of trouble cannulating, then kinked the wire so I had to do the line myself.”