

# VASCULAR ACCESS

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## Cannulation – How to Cannulate & Manage Complications



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# Cannulation Methods

Rope Ladder



Area Puncture



Buttonhole



# Table 11.a. Cannulation Methods and Recommendations

Cannulation Method	Vascular Access Type	Description of Arterial/Venous Needle Locations	Recommendations KDOQI 2019 VA Guidelines
Rope Ladder	<ul style="list-style-type: none"> <li>• AV fistula – surgical or endovascular</li> <li>• AV graft (synthetic or biological)</li> </ul>	Cannulation site is moved up and down the cannulation zone to allow full site rotation	11.2 Considered the Best Practice method for routine AV fistula or AV graft cannulation
Area Puncture	<ul style="list-style-type: none"> <li>• AV fistula – surgical or endovascular</li> <li>• AV graft (synthetic or biological)</li> </ul>	Limited segment of the cannulation zone is used for repeated cannulation	<b>Not Recommended</b> as a cannulation method
Buttonhole	<ul style="list-style-type: none"> <li>• AV fistula – surgical or endovascular</li> </ul>	Exact same cannulation site and angle is utilized to create a tissue tunnel track with a sharp needle then converted to a dull needle	<p>11.3-11.5 Use only under <b>special circumstances</b> given the associated increased risks of infection and related adverse consequences</p> <p><b>Special Circumstances:</b> very short segment cannulation zones, enlarging aneurysms (see Table 11.1)</p> <p><b>Recommend</b> 2 arterial and 2 venous buttonhole sites to allow rotation</p>

# Table 11.b. Cannulation Skills and Recommendations

Cannulator & Skill Set	Recommendations KDOQI 2019 VA Guidelines
Skilled cannulators with established high rates of success should perform initial cannulations	11.6
Have structured training and supervision of dialysis technicians and nurses before and during initial cannulation attempts and have regular training updates to maintain cannulation competency	11.7
Support & educate eligible patients on self-cannulation of their AV fistula or AV graft	11.8  (also CMS Conditions of Coverage V-tag 456)

# Table 11.c.

## Practical Applications for Cannulation Nephrologist Order Required for Cannulation

Should Include	Description
Cannulation Method	Rope Ladder unless special circumstances to utilize buttonhole cannulation (include the justification for the buttonhole method so if the justification changes in the future the cannulation method is reassessed). Consider adding no Area Puncture to the order.
Needle Type	Plastic cannula, sharp needle, dull buttonhole needle
Needle Length	3/5" short needle, 1" needle or 1 ¼" needle
Needle Angle	If vessel depth is measured with a cannulation map, the angle of entry can be calculated. Can also include needle insertion direction Arterial/Venous (antegrade or retrograde) as indicated
Needle Gauge	17, 16, 15, 14 gauge (may limit a maximum needle gauge)
Blood Flow Rate to Correspond to the Needle Gauge	No recommendations listed in the 2019 Guidelines  See "Matching needle gauge to the prescribed bloodflow rate (BFR)"
May cannulate & Needle Advancement	Initial Cannulation Protocol/Algorithm (typically facility or provider specific) No recommendations listed in the 2019 Guidelines
Any procedure adaptations for self-cannulation	Modifications to the taping procedure, needle insert and needle removal procedure

# Table 11.d. Matching Needle Gauge to the Prescribed Blood Flow Rate (BFR)

## Smaller needle gauge requires lower blood flow rates (BFRs)

General needle gauge guidelines and maximum BFR with the pre-pump arterial pressure (AP)  $\leq -200$  to  $-250$  mm Hg

- 17-gauge needle = 200–250 BFR
- 16-gauge needle = 250–350 BFR
- 15-gauge needle = 350–450 BFR
- 14-gauge needle =  $> 450$  BFR

Must monitor pre-pump AP to prevent excessive negative pressure from the blood pump drawing on the vascular access. Pre-pump AP should be  $\leq -250$  mm Hg for all needle gauges and BFRs

\* Follow your unit-specific nursing policy and procedure for specific needle gauge and maximum BFR.

# Cannulation Complications

## Statements: AV Access Cannulation Complications

12.1 KDOQI considers the following therapeutic interventions for cannulation injury reasonable to follow:

- Any size infiltration: apply ice for a minimum of 10 minutes and refrain from maximizing the blood pump speed. (Expert Opinion)
- If the infiltration is moderate, the needle should be withdrawn and manual pressure held over the infiltration site. (Expert Opinion)
- If the infiltration is significantly large, in addition to the above, a decision on the necessity for dialysis that day is required—if dialysis is required, a site proximal to the infiltration injury should be cannulated; if this is not possible, reattempt at the area of injury should not proceed until manual pressure and ice is applied for 30 minutes. (Expert Opinion)

- If a hematoma develops, close assessment of the site, the AV access, and the adjacent extremity should be made, including measurement of swelling, assessment of the presence of flow in the AV access both proximal and distal to the hematoma, and circulation to the associated extremity. (Expert Opinion)

12.2 KDOQI considers it reasonable to use ultrasound to help determine direction of flow and proper needle placement in the AV access of select patients as needed and performed by trained operators, to prevent cannulation complications. (Expert Opinion)