

# Matching Cannulators & Accesses

(FINAL May 6, 2008)

## Addendum to VA Guideline: Cannulation of AV Fistulas and Grafts



BC Renal Agency  
An agency of the Provincial Health Services Authority

### 1.0 Background

A provincial guideline entitled *Initial Cannulation of AV Fistula (AVF) and Graft (AVG)* was approved in May 2007. The guideline is evidence-based and consistent with national and international vascular access (VA) guidelines (guidelines published by both the Canadian Society of Nephrologists and the US National Kidney Foundation).

The guideline makes several recommendations, including one that requires matching the skills of cannulators to the ease of cannulating the accesses for individual patients. While this recommendation is consistent with that in the national VA guidelines, no site in Canada has yet operationalized this recommendation in practice. **This procedure outlines a process for this recommendation to be implemented in BC.**

### 2.0 Recommendation

The recommendation and rationale in the provincial guideline reads as follows:

***Recommendation 1: The skill level of cannulators is matched to the degree of difficulty of a specific access to cannulate (opinion).***

*Cannulation is a learned skill which improves with practice. Without good cannulation skills, an AVF or AVG can be damaged or destroyed. Research suggests that inexperienced dialysis staff have higher rates of access infection, infiltration, and loss.*

### 3.0 Operationalizing the Recommendation

#### Assessing Skills of Cannulators

1. The Unit Manager delegates at least two advanced cannulators as “cannulator assessors” at each HD centre. “Cannulator assessors” ensure RNs have met the requirements to be a novice, skilled, or advanced cannulator and designate accordingly.
2. Cannulation skills of RNs are assessed within the first month of hiring and upon achievement of the eligibility criteria for assessment to the next level as outlined in Appendix 1.

3. RNs may be designated as novice, skilled, or advanced cannulators. Requirements and expected competencies for achieving each of these designations are outlined in Appendices 1 and 2 respectively.
4. If an RN does not agree with his/her designation, he/she may request to be reassessed by a different assessor.

**Assessing Ease of Cannulating Accesses for Individual Patients**

5. The ease of a specific access to cannulate is assessed by two nurses (one of which is an advanced cannulator) and designated as easy, moderately complicated, or complicated.
6. Accesses are assessed for ease of cannulation prior to or at the time of first cannulation, 6 weeks after use, and when an RN perceives the difficulty to have increased or decreased (e.g., increased or decreased risk of infiltrations or initiation of access infection or resolution of infection).
7. Accesses are categorized as easy, moderately complicated, and complicated. The current category is indicated on the patient care plan. Definitions of each are available in Appendix 3.

**Matching Skills of Cannulators to the Ease of Cannulating Accesses for Individual Patients**

8. The skill level of the cannulator is matched to the ease of a specific access to cannulate in considering patient assignments.

| <b>Skill Level of Cannulator</b> | <b>Access Rating Approved to Cannulate</b>  |
|----------------------------------|---|
| Novice                           | Easy  |
| Skilled                          | Easy & moderately complicated               |
| Advanced                         | Easy, moderately complicated, & complicated |

9. In situations where there are no cannulators designated at the skill level required for a specific access, the most capable cannulator on shift will cannulate the access.

## Appendix 1: Skill Level of Cannulators

“Successful” cannulation is defined as:

- (1) Performed in accordance with the competencies outlined in Appendix 2; and
- (2) Using two needles, achieved the prescribed blood flow rate, and had no infiltrations.

“New” access is defined as:

- (1) AVF that has been successfully cannulated for less than 6 weeks.
- (2) AVG that has been successfully cannulated for less than 2 weeks.

“Established” access is defined as:

- (1) AVF that has been successfully cannulated for more than 6 weeks.
- (2) AVG that has been successfully cannulated for more than 2 weeks.

| Skill Level of Cannulator  | Criteria  |
|--|---|
| <p><b>Novice</b></p> <p><i>RN who assesses, cannulates, and troubleshoots needles of <u>established</u> AVFs and AVGs designated as “easy.”</i></p> <p><i>Does not cannulate <u>new</u> accesses. Does not <u>initiate</u> buttonhole tracks. Uses steel needles only.</i></p>   | <p>To be designated as a novice cannulator, must:</p> <ul style="list-style-type: none"> <li>• Review the PPT presentation and successfully complete the written quiz on <i>Cannulation for the Novice Cannulator</i>.</li> <li>• Demonstrate cannulation of an established AVF and AVG on a VA practice arm.</li> <li>• Under the observation of an advanced cannulator, successfully cannulate 3 <u>established</u> AVFs (with at least one having a buttonhole track) and 3 <u>established</u> AVGs designated as “easy.”</li> </ul> <p>Once the above has been completed, the cannulator is designated as “novice” and may cannulate AVFs and AVGs categorized as “easy.”</p>   |
| <p><b>Skilled</b></p> <p><i>RN who assesses, cannulates, and troubleshoots needles of <u>established</u> AVFs and AVGs designated as “easy or “moderately complicated.”</i></p> <p><i>Cannulates <u>new</u> accesses that meet all the criteria for “easy.” Does not <u>initiate</u> buttonhole tracks.</i></p> <p><i>Uses steel and teflon needles.</i></p> <p><i>Uses ultrasound to support cannulation.</i></p> | <p>To be eligible to be assessed as a skilled cannulator, must have at least 3 months cannulation experience and successfully cannulated 10 AVFs and 10 AVGs designated as “easy.”<sup>1</sup></p> <p>To be designated as a skilled cannulator, must:</p> <ul style="list-style-type: none"> <li>• Review the PPT presentation and successfully complete the written quiz on <i>Cannulation for the Skilled Cannulator</i>.</li> <li>• Under the observation of an advanced cannulator, successfully cannulate 3 <u>established</u> AVFs and 3 established AVGs designated as “moderately complicated.”</li> <li>• Under the observation of an advanced cannulator, successfully cannulate 3 <u>new</u> AVFs and 3 new AVGs designated as “easy.”</li> <li>• Under the observation of an advanced cannulator, successfully demonstrate the use of ultrasound to support the cannulation of at least one AVF or AVG.</li> </ul> <p>Once the above has been completed, the cannulator is designated as “skilled” and may cannulate AVFs and AVGs categorized as “easy” or “moderately complicated.”</p> |

<sup>1</sup> These cannulations must be in addition to those performed during the assessment phase of being designated a “novice” cannulator.

| Skill Level of Cannulator  | Criteria  |
|--|---|
| <p><b>Advanced</b></p> <p><i>RN who assesses, cannulates, and troubleshoots needles of AVFs and AVGs designated as “easy,” “moderately complicated,” or “complicated.”</i></p> <p><i>Cannulates all <u>new</u> accesses.</i></p> <p><i>Forms <u>initial</u> buttonhole tracks.</i></p> <p><i>Uses steel and teflon needles.</i></p> <p><i>Observes cannulation skills of colleagues &amp; offers feedback.</i></p> | <p>To be eligible to be assessed as an advanced cannulator, must have successfully cannulated 10 AVFs and 10 AVGs designated as “moderately complicated.”<sup>2</sup></p> <p>To be designated as a skilled cannulator, must:</p> <ul style="list-style-type: none"> <li>• Review the PPT presentation and successfully complete the written quiz on <i>Cannulation for the Advanced Cannulator</i>.</li> <li>• Under the observation of an advanced cannulator, successfully cannulate 3 AVFs and 3 AVGs designated as “complicated” that may or may not have been previously cannulated.</li> <li>• Under the observation of an advanced cannulator, successfully form a buttonhole track for an AVF.</li> </ul> <p>Once the above has been completed, the cannulator is designated as “advanced” and may cannulate all AVFs and AVGs.</p> |

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<sup>2</sup> These cannulations must be in addition to those performed during the assessment phase of being designated a “skilled” cannulator.

## Appendix 2: Competencies for Each Skill Level of Cannulators

| Cannulation (based on Guideline) |  | Skill Level at Which Demonstration of Competency is Required  |  |  |
|----------------------------------|--|---|--|--|
|                                  |  | Novice  | Skilled  | Advanced   |
| 1                                | If patient is highly anxious re needle discomfort, discusses the option of applying/injecting a local anaesthetic prior to needling.   | √   | √  | √  |
| 2                                | Instructs the patient to wash their access with anti-bacterial soap or scrub and water using friction.   | √   | √  | √  |
| 3                                | Assesses patient and vascular access <sup>3</sup> using  | √<br>Differentiates normal from abnormal in well developed, mature AVFs and AVGs; initiates follow-up actions | √<br>Differentiates normal from abnormal in well developed, mature AVFs and AVGs; distinguishes some types of abnormalities; initiates follow-up actions | √<br>Differentiates normal from abnormal in all types of AVFs and AVGs; distinguishes most types of abnormalities; initiates follow-up actions |
|                                  | a Inspection (look)  |   |  |  |
|                                  | b Auscultation (listen)  |   |  |  |
|                                  | c Palpation (feel)   | X   | √<br>Uses to assess vein depth & determine best cannulation sites  | √<br>Uses to assess vein depth, determine best cannulation sites, & identify problems in vessel  |
| d Portable ultrasound            |  |   |  |  |
| 4                                | Demonstrates knowledge and follows up signs and symptoms requiring consultation with the physician and/or VA Coordinator (e.g., infection, absence or poor quality of bruit and thrill, edema, aneurysm or pseudoaneurysm formation, inability to achieve appropriate blood pump speed, low arterial or high venous pressure, low access flow rate, and/or unexplained, prolonged bleeding). | √   | √  | √<br>Takes independent action on problems if authorized  |
| 5                                | Identifies the direction of blood flow at the access site.   | √   | √  | √  |
| 6                                | Visualizes the site(s) and plans for needle placement.   | √   | √  | √  |
| 7                                | Ensures clean gloves prior to cleansing and cannulating the site. Changes gloves if contaminated at any time during the cannulation procedure.   | √   | √  | √  |
| 8                                | Cleanses the site with a cleansing solution and allows skin to dry thoroughly. For AVFs, applies a tourniquet (or B/P cuff) to the access arm tight enough to dilate the veins but being careful not to occlude the flow.  | √   | √  | √  |
| 9                                | If desired by the patient, applies/injects the local anaesthetic (if using topical anaesthetic, may have already been applied by patient at home).   | √   | √  | √  |
| 10                               | Cannulates and threads the needle down the center of the AVF or AVG using approximately a 25 degree (AVF) or 45 degree (AVG) angle. Assesses the depth of the access and adjusts the cannulation angle accordingly.  | √<br>Utilizes steel needles only  | √<br>Utilizes steel and teflon needles   | √<br>Utilizes steel and teflon needles   |

<sup>3</sup> For details see information below chart (extracted from Guideline on Initial Cannulation of AV Fistulas and Grafts).

| Cannulation (based on Guideline) |   | Skill Level at Which Demonstration of Competency is Required |  |  |
|----------------------------------|---|--|--|--|
|                                  |   | Novice   | Skilled  | Advanced   |
| 11                               | Once flashback is visible, levels the needle to skin level and slowly advances the needle to the hub. Confirms needle placement by assessing blood flow into the tubing. If no blood returns, carefully adjusts needle.   | √  | √  | √  |
| 12                               | Assesses carefully for signs of infiltration (i.e., pain, swelling, or discoloration).  | √<br>Seeks out assistance if signs of infiltration present   | √<br>Takes action if signs of infiltration present     | √<br>Takes action if signs of infiltration present |
| 13                               | Secures the wings of the needle at the same angle of advancement. Applies adhesive device.  | √  | √  | √  |
| 14                               | Repeats steps 10 – 13 for the second needle.  | √  | √  | √  |
| 15                               | Once cannulation has been established, matches needle gauge to blood pump speed.  | √  | √  | √  |
| 16                               | Removes adhesive device and then removes the needle slowly and at the same angle that was used for insertion.   | √  | √  | √  |
| 17                               | After the needle is out, applies mild, localized, digital, direct pressure for 10 – 15 minutes to the needle exit sites of both the skin and graft or vessel wall, using a two digit technique over a haemostatic dressing.   | √  | √  | √  |
| 18                               | Places an adhesive or gauze pad on the cannulation site or ensure dressing used is secure.  | √  | √  | √  |
| 19                               | Prior to the patient leaving the unit, assesses and document the quality of the bruit and thrill.   | √  | √  | √  |
| 20                               | When initiating a new AVF or AVG, contacts physician to reassess heparin orders and heparin stop times (if not already ordered). Reassesses regularly during initial cannulations.  | X  | √  | √  |
| 21                               | When initiating a new AVF or AVG, demonstrates knowledge of appropriate cannulation sequence and needle sizes   |  |  |  |
|                                  | a   AVF with functioning CVC in place.  | X  | √  | √  |
|                                  | b   AVF with no functioning CVC in place and all AVGs.  | X  | √  | √  |
| 22                               | Uses appropriate technique for buttonhole cannulation.  | √<br>Under guidance, accesses well developed buttonholes     | √<br>Independently accesses well developed buttonholes | √<br>Initiates buttonhole tracks                   |
| 23                               | Provides patient teaching re cannulation: <ul style="list-style-type: none"> <li>• Cleansing of limb prior to dialysis</li> <li>• Rotation of sites or buttonhole site</li> <li>• Cannulation techniques</li> <li>• Pain/fear management strategies</li> <li>• Compression of access for hemostasis following needle removal</li> <li>• Emergency care in the event of a bleed</li> </ul> | √  | √<br>Explores interest in self-cannulation             | √  |

### Appendix 3: Ease of Access to Cannulate

| Ease of Access to Cannulate   | Criteria for AVFs  | Criteria for AVGs   |
|---|--|---|
| <p><b>Easy</b></p> <p><i>Can be cannulated by a novice, skilled, or advanced cannulator</i></p>           | <ul style="list-style-type: none"> <li>• AVF that has been successfully cannulated with no infiltrations for at least 6 weeks (i.e., <u>established</u> AVF)</li> <li>• Well matured</li> <li>• Vein firm, easily palpated and stable upon palpation (vein diameter of &gt;.6 cm)</li> <li>• Vein superficial (vein depth of &lt;.6 cm with discernible margins)</li> <li>• Area of straight vein available for cannulation</li> <li>• No irregular/dilated areas or aneurysm formations that interfere with cannulation</li> <li>• No collateral veins visible that interfere with cannulation</li> <li>• No edema, bruising, or signs of local infection</li> <li>• Access flow of &gt;500 mL/min</li> <li>• No limb tremors or muscle spasms</li> <li>• Patient is not anxious about needling or restless or confused</li> <li>• If buttonhole, well established track</li> </ul> | <ul style="list-style-type: none"> <li>• AVG that has been successfully cannulated with no infiltrations for at least 2 weeks (i.e., <u>established</u> AVG)</li> <li>• Palpable, uniform sized graft in a loop or straight configuration</li> <li>• Sufficient surface area for cannulation</li> <li>• No irregular/dilated or edematous areas</li> <li>• No signs of pseudoaneurysm formation</li> <li>• No signs of bruising or local infection</li> <li>• Access flow of &gt;650 mL/min</li> <li>• No limb tremors or muscle spasms</li> <li>• Patient is not anxious about needling or restless or confused</li> </ul> |
| <p><b>Moderately Complicated</b></p> <p><i>Can be cannulated by a skilled, or advanced cannulator</i></p> | <ul style="list-style-type: none"> <li>• Same as criteria for “easy” AVFs but have 1 of the cannulation complications listed under “complicated” AVFs</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>• <u>New</u> AVF that meets all criteria for “easy” except it has not yet been cannulated for 6 weeks</li> </ul>   | <ul style="list-style-type: none"> <li>• Same as criteria for “easy” AVGs but may have 1 of the cannulation complications listed under “complicated” AVGs</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>• <u>New</u> AVG that meets all criteria for “easy” except it has not yet been cannulated for 2 weeks</li> </ul>  |
| <p><b>Complicated</b></p> <p><i>Can be cannulated by an advanced cannulator</i></p>                       | <ul style="list-style-type: none"> <li>• Same as criteria for “easy” AVFs but have 2 or more of the cannulation complications listed below: <ul style="list-style-type: none"> <li>• Vein not easily palpable (vein deep or inconsistent depth; vein depth of &gt;.6 cm; vein may roll upon palpation)</li> <li>• Vein narrow (vein diameter of &lt;.6 cm)</li> <li>• Poorly defined area of straight vein available for cannulation</li> <li>• Visible dilated area or aneurysm formation that may interfere</li> </ul> </li> </ul>   | <ul style="list-style-type: none"> <li>• Same as criteria for “easy” AVGs but have 2 or more cannulation complications listed below: <ul style="list-style-type: none"> <li>• Graft difficult to palpate and/or not a uniform size (i.e., may bulge in places)</li> <li>• Graft deep or inconsistent depth (may be flat and/or mushy to palpate)</li> <li>• Limited area available for cannulation</li> <li>• Signs of false aneurysm</li> <li>• Access limb has signs of edema, bruising, or local infection</li> </ul> </li> </ul>  |

| Ease of Access to Cannulate | Criteria for AVFs   | Criteria for AVGs   |
|-----------------------------|---|---|
|                             | <p>with cannulation</p> <ul style="list-style-type: none"> <li>• Visible collateral veins that may interfere with cannulation</li> <li>• Access limb has signs of edema, bruising, or local infection</li> <li>• Recent and repeated infiltrations</li> <li>• Access flow of &lt;500 mL/min</li> <li>• Patient has muscle spasms or limb tremors</li> <li>• Patient is highly anxious about needling or restless and confused</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>• <u>New</u> AVF that has one or more of the cannulation complications listed above</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>• <u>Established</u> or <u>new</u> AVF in which a buttonhole track is being established.</li> </ul> | <ul style="list-style-type: none"> <li>• Recent and repeated infiltrations</li> <li>• Access flow of &lt;650 mL/min</li> <li>• Patient has muscle spasms or limb tremors</li> <li>• Patient is highly anxious about needling or restless and confused</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>• <u>New</u> AVG that has one or more of the cannulation complications listed above.</li> </ul> |