

Management of Complex Access in the Haemodialysis Patients

Key Points

- Cannulation of complex dialysis access
- Maturation of the complex access
- Managing Needle Infiltration
- Managing complications of failed cannulation

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Abbreviations

AVF	Arterio-Venous Fistula
AVG	Arterio-Venous Graft

Summary

Premature needling should be avoided as it often results in early access loss, which may be due to haematoma formation or the application of excessive external pressure to control haemorrhage (UK Kidney Association (2023))

Number of weeks of maturation of Complex Access prior to needling:

- *Necklace graft - 2 weeks*
- *Jump graft - the fistula can be needled immediately as long as the jump graft is not*

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Introduction

Complex Access is created when:

- the patient does not have any suitable veins in their arms to make a simple fistula
- the main central vein is obstructed, making it impossible to create an arm fistula
- the patient is not suitable for peritoneal dialysis
- the patient is not suitable or cannot have a kidney transplantation at the moment

Protocol

To successfully manage and cannulate complex access and to prevent complications in the haemodialysis patient.

Choice of needles

Kim et al (2005) advocate the use of smaller gauge needles as their study indicates that the lower gauge needles show a lower incidence of bleeding, with potentially less disruption of the access, improved patient tolerance and lower recirculation rates at higher pump speeds. The needles used in the study ranged from 14 to 17 gauge.

Cannulation

Many authors quote Gallieni, M. *et al.* (2019) for reference for AV fistula cannulation. Gallieni, M. *et al.* (2019) describes three methods of cannulation:

1. *The Rope Ladder* Uniform needle sites along the length of the vessel causing uniform dilatation of the vein, with little stenotic formation. The nurses in this unit should adopt this method of needling where possible.
2. *Button Hole Puncture* The needles are inserted in the same places and the same sites after removal of the clots. Wang, L.P. *et al.* (2022) states that critics of this technique claim there is an increased risk of infection, thrombosis and aneurysms but that those that have used this method refute this, claiming there is less pain, fewer repeated cannulations and no increase in infections or aneurysms.

3. *Area Puncture*. Concentrated puncture over a small area. Repeated punctures destroy elasticity of the Wall of the vessel leading to the aneurysm formation with a tendency of stenotic folding at the border of the aneurysm Daugirdas et al (2014). This method of needling where possible should be avoided or if used alternative methods of needling should be explored.

General procedure to be applied to ALL Complex Access:

1. Newly created Complex Access can be cannulated as per surgeon instruction at two weeks or immediately post creation **if directed by surgeon**. Initial attempts to perform dialysis via new Complex Access shall proceed with caution with reference to the surgical notes provided by the Surgeon.
2. Complex Access shall not progress faster than these guidelines ***without direction from the Renal Vascular Access Team, Consultant and Vascular Surgeon***.
3. Surgeon to draw diagram of the structure of the newly created Complex on operation with additional instructions regarding cannulation if necessary. Staff should access EPIC to see the appropriate diagram
4. *Haemodialysis staff to obtain order from vascular surgeon or nephrologist to begin cannulation of fistula according to guidelines above 2 weeks post creation. All new Complex Access should be examined by surgeon before cannulation is initiated.*
5. Only staff identified as demonstrating best cannulation practice techniques should be assigned to cannulate newly created Complex Access.
6. Explain procedure to patient.

General Instructions for Cannulation of Complex Access

Week One

- Check anti-coagulation regime against surgical instruction for anticoagulation following access surgery'
- ***ALWAYS use 17-gauge needles at a blood flow rate (BFR) of 250 ml/min. If BFR not tolerated, reduce to 200 ml/min.***
- ALWAYS stay at least 1.5-2 cm away from the anastomosis.
- Closely assess the access to establish depth and angle at which to insert needle.
- Clean the site using a Chloroprep. Cannulation should be considered a surgical procedure with risks of contamination and infection, hence do not further palpate if possible once the site has been cleaned.
- Cannulate the fistula.
 - Stabilize the butterfly with tape. Secure the access with a chevron shaped tape. Apply one more strip of tape across the chevron.
 - Secure dialysis lines with Micropore tape.
 - Instruct patient not to move access extremity, in order to prevent infiltration.
 - Blood flow rates are recommendations and can be modified based on center-specific guidelines.

ONLY INCREASE BFR RATES IF NO EVIDENCE OF INFILTRATION OR OTHER PROBLEMS NOTED.

- Report any cannulation or BFR problems to the Vascular Access Nurses.

Week Two

- If the first week is successful, cannulate with 16 gauge needles, rotating cannulation sites.
- Blood flow rate recommended: 300 ml/min.

Week Three

- Either repeat procedure for week two or may attempt to progress to prescribed BFR and needle gauge. When increasing BFR, recommend matching needle gauge to BFR as shown in the chart below.

RECOMMENDED: It is important to match needle gauge to blood flow rate (see below).

BLOOD FLOW RATE	NEEDLE GAUGE
<300 ml/min	17 gauge
300 – 350 ml/min	16 gauge
>350 - 450 ml/min	15 gauge

Note: These are minimum recommended gauges for the stated BFR settings. Larger needles, when feasible will reduce (make less negative) pre-pump arterial pressure and increase delivered blood flow.

Infiltration Instructions

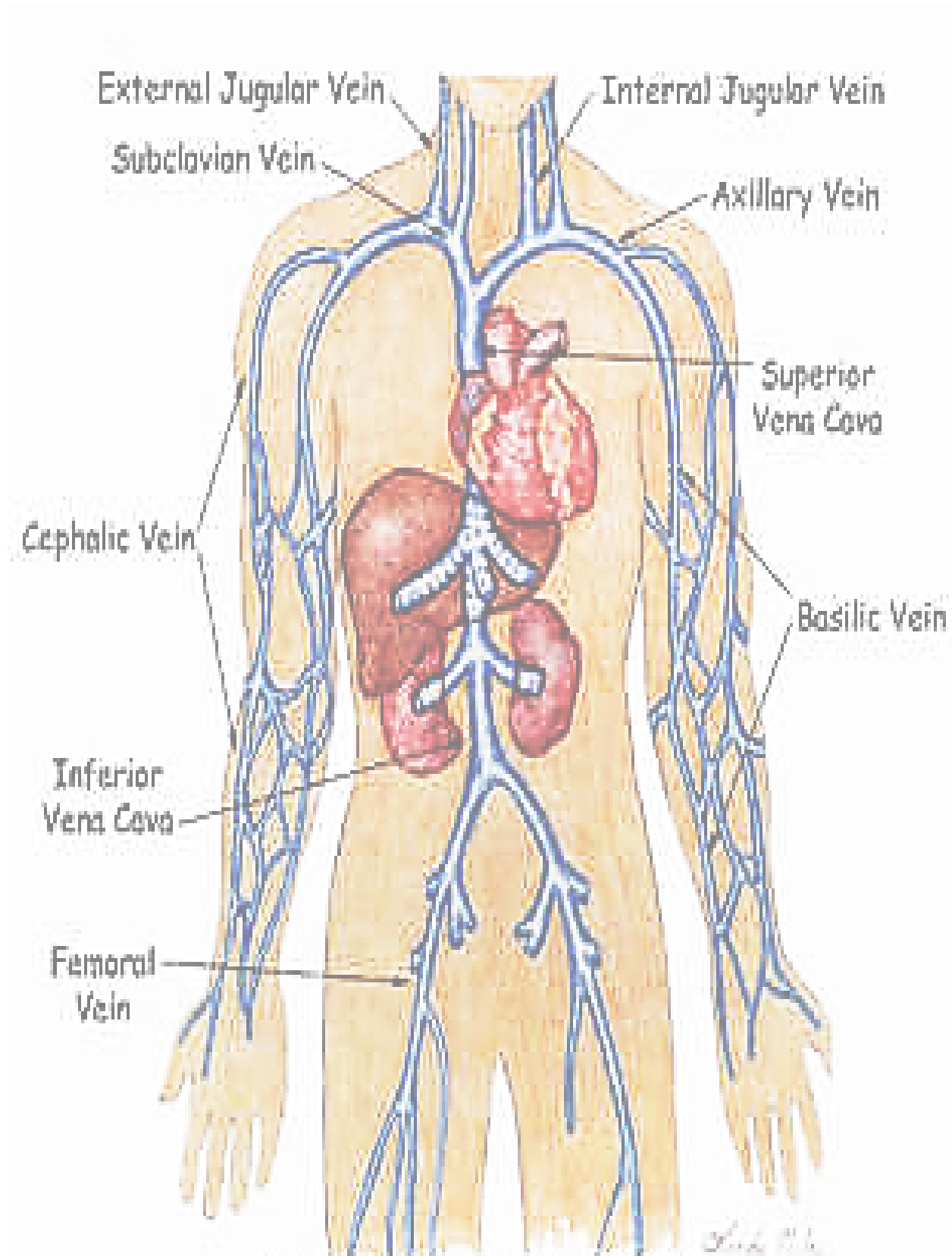
- If the access infiltrates, let it “rest” for one week and then go back to smaller gauge needles.
- If the access infiltrates a second time, wait another two weeks and then go back to smaller gauge needles.
- If the fistula infiltrates a third time, notify surgeon.

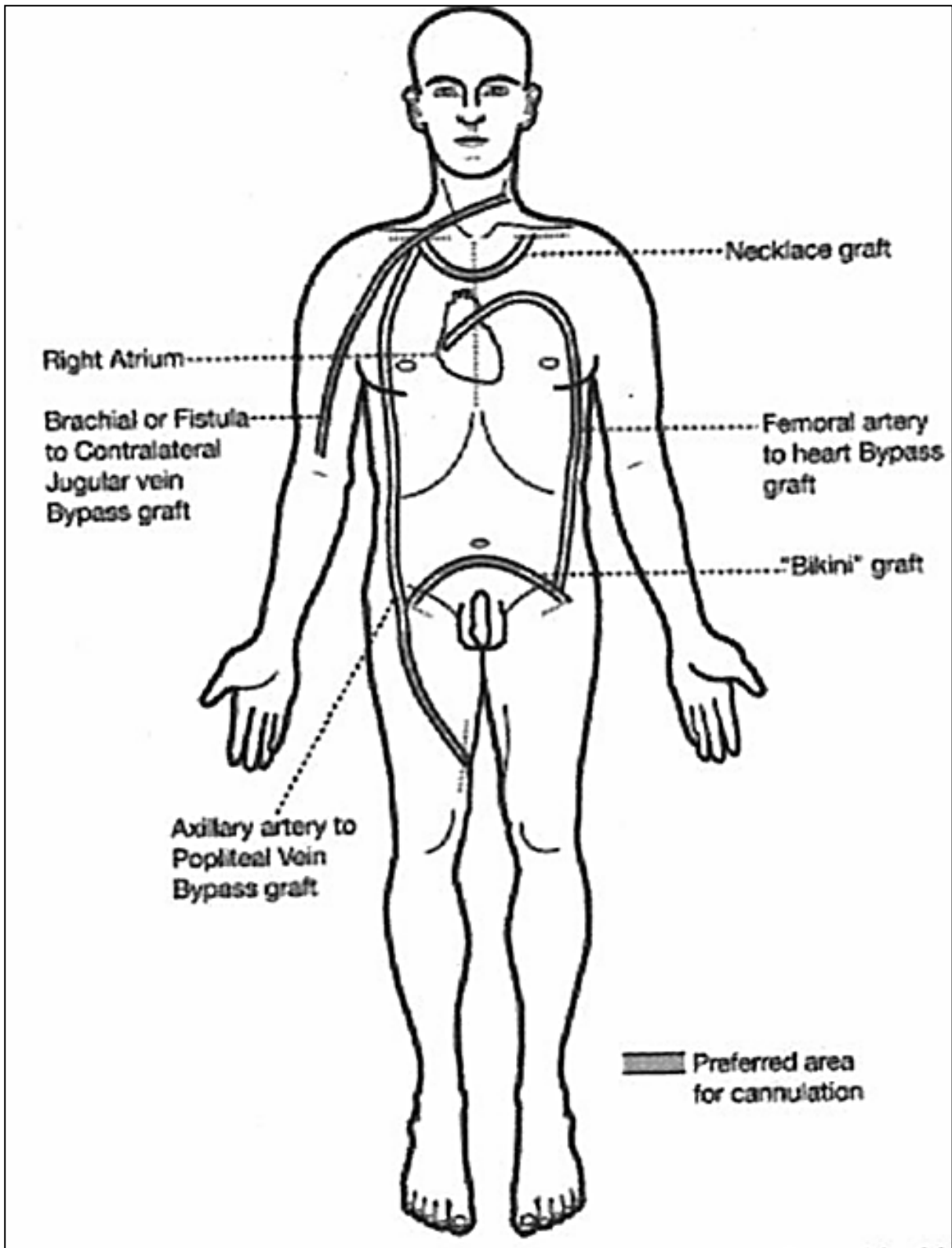
Catheter Removal Instructions

The patient’s catheter is not to be removed until the patient has had at least *THREE CONSECUTIVE SUCCESSFUL* arterial/venous needle cannulations at the prescribed BFR and needle gauge.

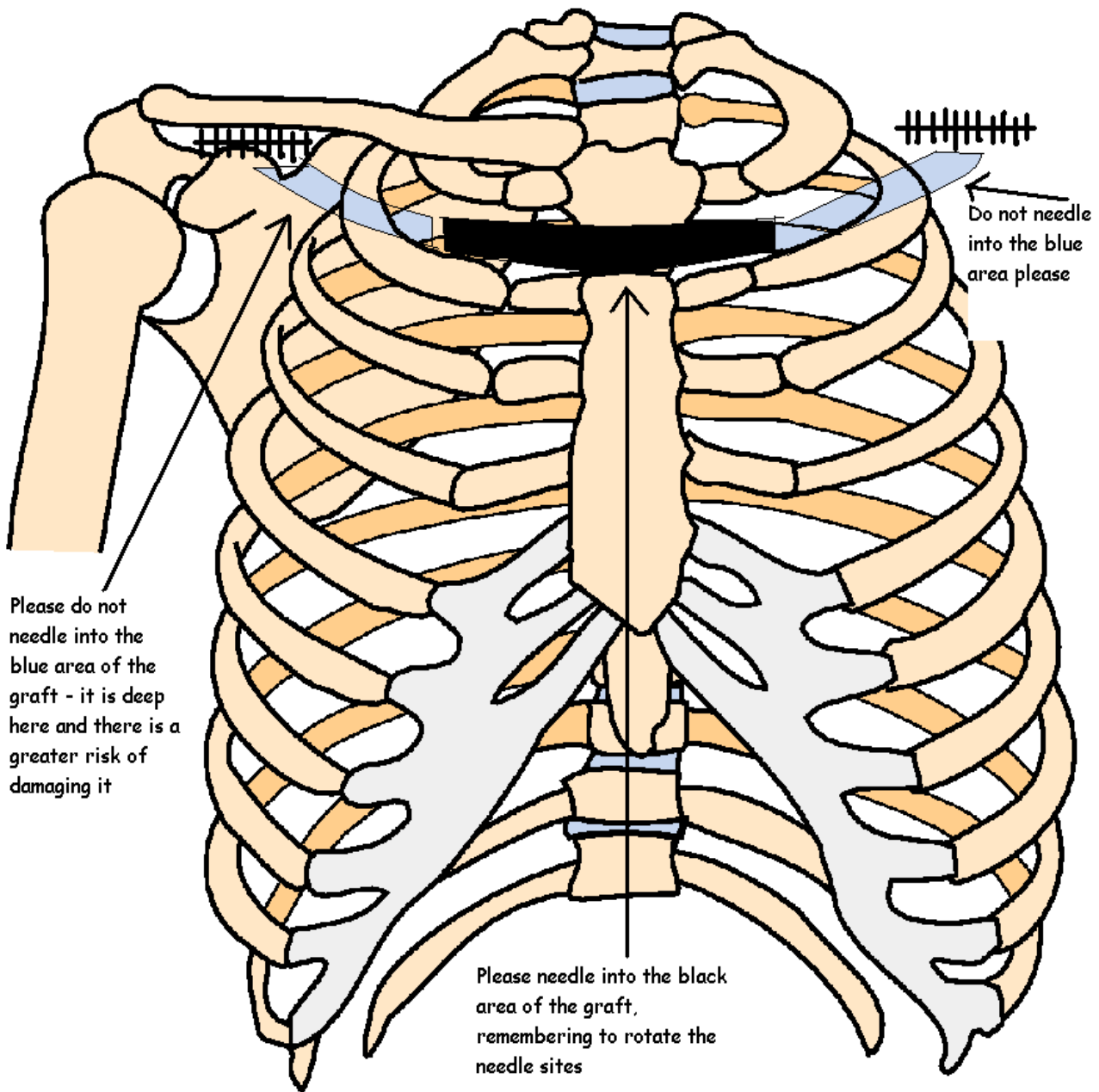
*NOTE: If the catheter becomes infected within the first two weeks of fistula formation then the catheter should be removed and the patient referred to medics for further clinical assessment.

Vessels That Can Be Used When Creating Novel Access



CANNULATION SITES FOR NOVEL ACCESS

How to cannulate a necklace graft from right axillary artery to left axillary vein. (Please note: necklace grafts can be right to left or left to right)



- Assess the bruit prior to needling
- Do a visual assessment looking for any signs of infection, aneurysm, or anything unusual
- The arterial needle may point in either direction
- The venous needle must point towards the left shoulder
- Needle in the black area as shown on the diagram
- Rotate the needle sites within this black area
- Avoid needling in the blue areas as shown on the diagram – the graft is at an awkward angle here and there is a greater risk of graft damage
- Document each needling

REFERENCES:

Kim, Y. O. et al. (2005) 'The effect of dialysis needle size on hemodialysis adequacy', *Hemodialysis International*, 9(1), P. 76. Available at: <https://doi.org/10.1111/j.1492-7535.2005.1121o.x> (Accessed: 21 September 2023).

UK Kidney Association (2023) *Clinical practice guideline: vascular access for haemodialysis*. Available at: <https://ukkidney.org/sites/renal.org/files/FINAL%20FORMATTED%20Vascular%20access%20for%20haemodialysis%20April%202023.pdf> (Accessed: 25 April 2024).

Gallieni, M. et al. (2019) 'Clinical practice guideline on peri- and postoperative care of arteriovenous fistulas and grafts for haemodialysis in adults', *Nephrology Dialysis Transplantation*, 34(Suppl 2), pp. ii1-ii42. Available at: <https://dx.doi.org/10.1093/ndt/gfz072>

Wang, L.P. et al. (2022) 'Effect of buttonhole cannulation versus rope-ladder cannulation in hemodialysis patients with vascular access: a systematic review and meta-analysis of randomized/clinical controlled trials', *Medicine (Baltimore)*, 101(29), article number e29597. Available at: <https://doi.org/10.1097/md.00000000000029597>

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Full version control record

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Contributor(s):	Sijo Stephen (Senior Charge Nurse)
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This guideline has been registered with the Trust. However, clinical guidelines are guidelines only. The interpretation and application of clinical guidelines will remain the responsibility of the individual clinician. If in doubt, contact a senior colleague or expert. Caution is advised when using guidelines after the review date.

This guideline is for use in Frimley Health NHS Foundation Trust hospitals only. Any use outside this location will not be supported by the Trust and will be at the risk of the individual using it.

Version History

Version	Date	Guideline Lead(s)	Status	Comment
1	October 2017	Sijo Stephen	Final	Review
2	May 2024	Ana Fleet (Renal Vascular Access CNS) Sijo Stephen (Senior Charge Nurse)	Final	

Related Documents

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None	Cannulation of Newly Created AVF/AVG