

Use of Point-of-Care Handheld Ultrasound for Vascular Access in Haemodialysis Summary of Published Data

Vascular access trauma due to poor needle placement can have serious effects on the longevity of the vascular access.¹ Mis-cannulation of new AVF is very high, with nearly 51% of fistula having a mis-cannulation within the first three dialysis sessions.²

By six months, less than 10% of new AVF would have uncomplicated cannulations with two needles for every HD session.² Ultrasound in general vascular practice is not a new concept; it has been used for over 30 years, with many published advantages of cannulation success.³

Ultrasound use in renal vascular access is growing globally. This is largely due to the development of lighter, more portable point-of-care equipment, which enables assessment at the bedside.³

Point-of-care ultrasonography provides a comprehensive visual format and greatly enhanced cannulation outcome and experience.²

Point-of-care ultrasound-guided cannulation will likely change the paradigm of dialysis care.²

In 2018, the British Renal Society / VASBI VASCULAR ACCESS special interest group published Clinical Practice Recommendations for Needling of Arteriovenous Fistulae and Grafts for Haemodialysis.⁴

These include recommendation K: The Use of Nurse-Led Ultrasound to Assist with Needling.⁴

The clinical practice recommendations state that ultrasound images can be used:

- To assess the maturity of an AV fistula vein, to identify if it is ready for needling.
- To assess the AV fistula vein/graft before needling if it is difficult to palpate or has previously been difficult to cannulate.
- To view the AV fistula vein/graft during needling, undertaking ultrasound imaging concurrently with needling, allowing assessment of the vessel's response to needle insertion.

They also state:

- Ultrasound assessment of an AV access should complement clinical assessment and never replace the initial look, listen and feel assessment. The results of ultrasound imaging of an AV access should be interpreted in conjunction with clinical assessment. Ultrasound imaging alone is not a complete assessment of the AV access.
- Ultrasound images interpreted by a registered nurse to demonstrate abnormal findings should be referred to an experienced ultrasound practitioner for interpretation. The nursing interpretation alone should not lead to a definitive diagnosis.

In 2023, the UK Kidney Association published their Clinical Practice Guideline Vascular Access for Haemodialysis.⁵

In the vascular access maturation section, they recommend:

Maturation		
3.7	We recommend regular monitoring of new fistulas for maturation, using a 'look, feel and listen' approach, supported where necessary by ultrasound.	1C

In the vascular access cannulation section, they recommend:

Cannulation		
3.15	We recommend unit policies to measure and minimize cannulation complications, which may include ultrasound assisted cannulation or single needle haemodialysis for new or difficult AV access.	1C

Continued overleaf...

An additional 2018 publication in the Canadian Association of Nephrology Nurses and Technologists Journal presented their findings on:

Ultrasound evaluation of intraluminal needle positioning during Haemodialysis: Incidental findings of cannulation complications.¹

Ultrasound evaluations of intraluminal needle position were performed in patients who underwent successful cannulations (i.e., one arterial needle and one venous needle) without ultrasound guidance (blind cannulation) and who had achieved the prescribed pump speed without interruption. This study showed that the assumption of needle placement in the centre of the vessel lumen with blind cannulation was correct only **9.3% of the time**. These results have important implications related to mechanical and haemodynamic trauma to the inner lining of the access wall. The study found that 61.6% of the needles were in the anterior position regardless of the combined access depth or diameter. In most cases, this was due to securing the tape and pressing the metal needle butterfly wings against the patient's arm.

The unexpected findings of two cases of severe needle engagement (needle tip piercing through the access wall), in which patients had no discomfort, and the dialysis machine venous pressures were within parameters, caused much surprise and a new concern. One can wonder how often "back-walling" occurs during blind cannulation or needle repositioning and goes unnoticed.

Hypothesis of economic impact:

- Point-of-care ultrasonography provides a comprehensive visual format and greatly enhanced cannulation outcome and experience².
- Enhanced cannulation outcomes may result in improved fistula longevity.
- Improved fistula longevity may result in a reduction of conversions from fistula to central venous catheter.

Below are the NICE national average costs associated with CVC and vascular ultrasound procedures:

Insertion of CVC	£552 (day case average of non-tunnelled & tunnelled procedures 50% / 50%)
Attention to CVC	£354 (day case)
Removal of CVC	£458 (day case)
Vascular ultrasound	£58

Assuming each fistula to CVC conversion undergoes:

- One ultrasound examination
- One CVC insertion procedure
- One CVC attention procedure
- One CVC removal procedure

The cost associated with the conversion to CVC is £1,428

Point-of-care ultrasound technology can now be purchased for ~£6,800

Therefore, once 4.8 patient conversions have been avoided, the ultrasound cost has been more than covered

All future fistulae preserved, avoiding CVC conversion, **accrue £1,428 savings per patient**

£1,428 x 4.8 = £6,854

1. Marticorena, R.M.; Kumar L.; Bachynski, Jovina Concepcion; Dacouris N; Smith I; Donnel (2018), Ultrasound evaluation of intraluminal needle position during haemodialysis: Incidental findings of cannulation complications
2. Lalathasha Kumbar, Karthik Ramani and Deborah Brouwer-Maier (2020), Considerations in Access Cannulation: Traditional and Evolving Approaches
3. Schoch M.L., Du Toit D., Marticorena R.M., Sinclair P.M. (2015) - Utilising point of care ultrasound for vascular access in haemodialysis
4. Clinical Practice Recommendations for Needling of Arteriovenous Fistulae and Grafts for Haemodialysis (2018), Recommendation K: Use of Nurse-Led Ultrasound to Assist with Needling
5. UKKA Clinical Practice Guideline Vascular Access for Haemodialysis (April 2023)

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