

has resulted in more complications requiring an estimated 68% increase in interventions to repair accesses.⁵

The failure rate of hemodialysis access in the first year is high.⁶ In 5.1% of patients, early thrombosis occurs within 18 days of arteriovenous fistula (AVF) creation and is associated with a small arterial diameter, a forearm location, a small draining vein diameter, protamine use, female sex, surgeon frustration/concern during the access creation procedure, and a reduced or absent thrill at surgery.⁷ After fistula maturation and use, subsequent failure is frequently associated with thrombosis secondary to underlying focal stenosis, most commonly at the anastomosis. Clinical monitoring of AVF function is recommended to detect deterioration in function before thrombosis occurs.^{8–10} However, in arteriovenous grafts (AVGs), occult stenosis may be present in a significant number of patients with normal findings on clinical evaluations.^{11,12} The reported sensitivity of a clinical examination for stenosis in AVGs is only 36% to 57%.^{13,14} In patients who have abnormal flow volumes, salvage procedures or surgical revision may lengthen the life of the access, but there are conflicting data in the literature.^{15–18} In a data analysis of 40,132 Centers for Medicare and Medicaid Services beneficiaries, the benefits of percutaneous intervention were greatest in patients with new-access or low-access flow rates.⁶ Differences in flow parameters within an AVF versus an AVG must be considered, as different diagnostic Doppler criteria for stenosis are associated with these two access types. This practice parameter is intended to help physicians in the performance of hemodialysis access evaluations by ultrasound, to ensure a high-quality diagnostic examination, and to promote further understanding of potential salvage options.

This practice parameter will address primarily upper extremity hemodialysis access. Although lower extremity hemodialysis grafts have a significant role in patients without usable upper extremity access, the diagnostic Doppler criteria for lower extremity hemodialysis graft evaluation are less well defined.

Indications

Indications for hemodialysis access ultrasound include but are not limited to the following:

1. Hemodialysis access blood flow inadequate for dialysis, defined as a flow volume of less than

500 to 600 mL/min or patients who have an interval 25% decrease in blood flow.

2. Patients who develop persistent ipsilateral upper extremity edema or pain after access placement or during hemodialysis.
3. Patients with delayed maturity (>6 weeks) of a surgically created AVF.
4. Patients suspected of having a pseudoaneurysm (PSA), AVF, graft stenosis, perigraft soft tissue infection, or adjacent fluid collection.
5. Patients with a decreased or absent thrill or abnormal bruit over hemodialysis access.
6. Follow-up after an intervention.
7. Patients with clinical signs or symptoms of hand/digit ischemia typically during or immediately after hemodialysis but that may occur at other times.
8. Access collapse during hemodialysis.
9. Prolonged bleeding (>20 minutes) from access needle sites.
10. Unexplained decrease in the delivered dose of hemodialysis (Kt/V). Kt/V is the product of dialyzer clearance and time divided by the volume of water in the patient.
11. Repeated difficult cannulation.
12. Thrombus aspiration during hemodialysis.
13. Elevated venous pressure greater than 200 mm Hg on a 300-mL/min pump.
14. Elevated recirculation time greater than 15%.

There are no absolute contraindications to performance of this examination, but there may be physical limitations that prevent a complete duplex Doppler examination, such as the presence of indwelling catheters, open wounds, recent surgery, pain, scar tissue or calcification especially in the regions of multiple puncture sites, severe edema, contractures, and other reasons for immobility.

Qualifications and Responsibilities of Personnel

Physicians interpreting or performing this type of ultrasound examination should meet the specified AIUM Training Guidelines in accordance with AIUM accreditation policies.

Sonographers performing the ultrasound examination should be appropriately credentialed in the