KDOQI Vascular Access Guidelines: A Clinician’s Perspective

By Dalia Dawoud

In 1996, the Kidney Disease Outcomes Quality Initiative (KDOQI) was created by a multidisciplinary group of physicians with the support of the National Kidney Foundation. It was the first literature-based practice guideline and was developed with the hope of measurably improving the quality of life and clinical outcomes for dialysis patients. To achieve this objective, four work groups were created, one of which was dedicated to clinical practice guidelines related to vascular access for patients requiring hemodialysis (HD) (1). The vascular access guidelines have since undergone three updates: in 2000, 2006, and most recently, in 2019.

The 2019 vascular access guidelines have been expanded to 26 separate sets of guidelines that were based on review of more than 4600 publications. As with the earlier versions, evidence-based and opinion-based guidelines were differentiated; in the 2019 guidelines, each recommendation was qualified by using a “Grading of Recommendations, Assessment, Development, and Evaluation” (GRADE) approach. Furthermore, when applicable, each guideline statement was accompanied by rationale/background information, a detailed justification, monitoring and evaluation guidance, implementation considerations, special discussions, and recommendations for future research (2).

From a clinician’s perspective, it is gratifying to see how the 2019 vascular access initiatives and guidelines have progressed from stringent recommendations, such as mandating specific thresholds of fistula or catheter prevalence, to a more clinically based approach that takes into consideration the individual patient context, such as patients with poor long-term prognoses and short life expectancies. Since the Fistula First Initiative emerged from the 2001 KDOQI vascular access guideline update, a significant increase in the utilization of arteriovenous fistulas (AVFs) in HD patients has been reported, from <20% of US end stage kidney disease (ESKD) patients at the time of the original guidelines to >60% prevalence of AVF in the US HD population today. A widely held opinion, however, is that these guidelines have, at times, also had a negative impact on patient care. This negative impact is mainly attributable to unintended outcomes, such as the rising numbers of upper-arm fistulas, which may negatively impact a patient’s future vascular access options. Another unintended consequence is that whereas the number of AVF creations has significantly increased, it is not necessarily paralleled by subsequent use of AVFs. The increase in fistula creations has been mainly due to a reduction in initial arteriovenous graft (AVG) creations and use, rather than a reduction in central venous catheter (CVC) utilization; CVC use remains unchanged and exceeds 80% for incident HD patients, perhaps due to the high fistula failure rate (3).

The 2019 KDOQI vascular access guidelines have a much more patient-focused approach that recognizes the differences in practice patterns among clinicians, while still focusing on providing high-quality standards that offer dialysis access choices customized to individual patients’ goals and preferences. The ideal access is no longer “a fistula”; it is any type of access that is reliable, can deliver adequate dialysis without complications, and is suitable for each individual patient’s needs: “The right access, in the right patient, at the right time, for the right reasons.”

The “ESKD Life-Plan,” adopted in the 2019 document (Guideline 1), provides a patient’s individualized lifetime map of dialysis modalities by creating a “P-L-A-N” (patient life-plan first, then access needs). The comprehensive vascular access plan includes an access creation plan, contingency plan, succession plan, and underlying vessel preservation plan (2).

### Table 1. Differences between previous and current KDOQI guidelines

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<tr>
<th>KDOQI 2006</th>
<th>KDOQI 2019</th>
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<td>Emphasis on a “fistula first” approach to vascular access choice due to the AVF associations with superior patency and lower complications compared with other vascular access types. Based on observational data and potentially flawed interpretations. A population approach to care was emphasized.</td>
<td>Emphasis on “The right access, in the right patient, at the right time, for the right reasons.” A patient-centered approach to HD vascular access that considers multiple aspects of a patient’s needs and dialysis access eligibility. Based on understanding potential biases of prior data and lessons learned from unintended consequences. An individualized approach to care is emphasized, recognizing overall population benefits to proposed strategies.</td>
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<td>A vein with a 2.5mm minimum vein diameter and arterial diameter of 2.0 mm was suggested as a guideline for AVF creation.</td>
<td>No minimum diameter threshold is required to create an AVF; arteries and veins of &lt;2 mm in diameter should undergo careful evaluation for feasibility and quality to create a functioning AVF.</td>
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<td>Primary AVF creation (radial-cephalic, followed by brachio-cephalic) is specifically recommended as a first AV access before considering an alternate access. The guidelines are unclear about the selection of type and site of AVF access in an initial failed attempt for a second AV access.</td>
<td>Emphasis on the importance of choosing the site (location) of the AV access (AVF or AVG) after careful consideration of the patient’s specific characteristics, such as advanced age, comorbidities, or short life expectancy. Case scenarios and algorithms are given as examples. Secondary access sequences are suggested after considering the patient’s ESKD Life-Plan.</td>
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<td>Long-term dialysis catheters should be avoided, particularly on the same side of a maturing venous access.</td>
<td>The use of tunneled CVCs for short-term or long-term durations for incident patients is appropriate in valid clinical circumstances (listed).</td>
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<td>Right internal jugular vein is the preferred site for tunneled, cuffed venous dialysis catheters, regardless of clinical situation.</td>
<td>In urgent dialysis start situations, under limited-use circumstances (e.g., &lt;3 months) and when transplant is not an option, the use of a tunneled, cuffed femoral CVC may be an appropriate approach.</td>
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<td>Subclavian veins should be used only after all other upper-extremity sites are exhausted.</td>
<td>When there are valid reasons for use, and duration of use is expected to be prolonged (e.g., &gt;3 months) without anticipated use of AV access, CVC insertion is preferred, in the following locations in order of preference: internal jugular, external jugular, femoral, subclavian, and lumbar.</td>
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<td>No recommendation with regard to pharmacologic therapies to assist AVF maturation.</td>
<td>Suggestions not to use allogeneic endothelial implants or percutaneous elastase to improve AVF maturation, patency, or clinical usability or to improve AVG graft patency or reduce thrombosis.</td>
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<td>Grafts and fistulae should be regularly monitored for stenosis via quantitative measurement of flow within the vascular access, static venous dialysis pressures, duplex ultrasound, and/or physical examination.</td>
<td>There is no evidence to make a recommendation on routine AVF and AVG patency surveillance by measuring access blood flow, pressure monitoring, or imaging for stenosis, that is, additional to routine clinical monitoring, to improve access patency. The guidelines indicate “monitoring of vascular access is primarily, while surveillance findings are supplementary, and action should not be based solely on surveillance findings.”</td>
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<td>Angioplasty should be performed if &gt;50% stenosis is present in either the arterial or venous limbs. Successfully treated lesions should have &lt;30% residual stenosis.</td>
<td>Preemptive angioplasty of AVFs and AVGs with stenosis, not associated with clinical indicators, to improve access patency is not recommended. There is an emphasis on intervention in the presence of clinical indicators and no intervention in the absence of clinical indicators.</td>
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<td>Abandoning of the AVF to more recent attempts at AVF thrombectomy and AV access salvage.</td>
<td>Management of each episode of AV access thrombosis is at the operator’s/clinician’s best judgment and discretion, including considering the patient’s dialysis access succession plan that is consistent with the ESKD Life-Plan.</td>
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<td>Definition of a CVC dysfunction: failure to maintain extracorporeal blood flow of &gt;300 mL/min at a prepump arterial pressure more negative than −250 mm Hg treatment.</td>
<td>A CVC fibrin sheath associated with adverse clinical manifestations (CVC dysfunction and/or infection); a CVC exchange, with or without balloon disruption of the fibrin sheath, should be performed.</td>
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The guidelines also have renewed approaches of older topics to optimize the patient’s access options. For example, they propose a surprising sequence of dialysis catheter locations, prioritizing femoral catheterization over subclavian catheterization in urgent dialysis start situations until the AV access or peritoneal dialysis (PD) catheter can be quickly created and used, which is justified by the potential to limit central stenosis. It is worthwhile taking the time to read the detailed justifications to the guideline’s statements.

The inclusion of the subclavian vein as a possible site was also unexpected in light of the well-reported central venous catheterization complications.

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vein stenosis following subclavian vein catheterization. However, it is about always having a contingency plan for vascular access options, which are based on evidence obtained from studies of dialysis patients:

Definite: Same organism from a semiquantitative culture of the catheter tip (>15 colony-forming units [CFU]/catheter segment) and from a BC in a symptomatic patient with no other apparent source of infection.

Probable: Defervescence of symptoms after antibiotic therapy, with or without removal of the catheter, in the setting in which BC confirms infection, but catheter tip does not (or catheter tip does, but blood does not) in a symptomatic patient with no other apparent source of infection.

Possible: Defervescence of symptoms after antibiotic treatment or after removal of catheter in the absence of laboratory confirmation of bloodstream infection (BSI) in a patient with no other apparent source of infection.

References

Vascular Access Guidelines
A Patient's Perspective

By Evan Coaker

I have been a dialysis or transplant patient since 1988. Alport's syndrome, a familial illness, struck my family in 1971. That year, one of my older brothers became sick at 16 years of age and died later that year. My other two brothers got sick in 1973 and progressed to dialysis. Both received transplants in 1975, but my oldest brother succumbed to an opportunistic infection a year later. My younger brother is still living.

My own history began with a kidney biopsy in 1972, and I got regular bloodwork to monitor my kidney function until my blood pressure began rising in the early 1980s. In late 1987, a nephrologist spoke the words I had dreaded: "You will need to begin dialysis soon." I had begun to notice I was winded and nauseated after any kind of strenuous activity.

In summary, the updated 2019 vascular access guidelines have gained refinement in development, grading, and reporting. The expected conveyance from population-based practice to patient-centered practice would substantially affect overall clinical vascular access management and patient outcomes for years to come. These guidelines are a welcome and refreshing change that can be practically implemented by clinicians.

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KDOQI 2006

The definition for diagnosing catheter-related bacteremia adapted the following Centers for Disease Control and Prevention (CDC) definitions for catheter-related infections, which are not based on evidence obtained from studies of dialysis patients:

Definite: Same organism from a semiquantitative culture of the catheter tip (>15 colony-forming units [CFU]/catheter segment) and from a BC in a symptomatic patient with no other apparent source of infection.

Probable: Defervescence of symptoms after antibiotic therapy, with or without removal of the catheter, in the setting in which BC confirms infection, but catheter tip does not (or catheter tip does, but blood does not) in a symptomatic patient with no other apparent source of infection.

Possible: Defervescence of symptoms after antibiotic treatment or after removal of catheter in the absence of laboratory confirmation of bloodstream infection (BSI) in a symptomatic patient with no other apparent source of infection.

The definition for diagnosing catheter-related bacteremia is based on evidence obtained from studies of dialysis patients. It is practical, as it allows the use of the dialysis circuit to get the blood cultures (BCs), which has the benefit of preserving veins for AV access creation but also reduces contamination.

Clinical manifestations and at least 1 positive BC from a peripheral source (dialysis circuit or vein) and no other apparent source, with either positive semiquantitative (>15 CFU/catheter segment, hub or tip) or quantitative (>102 CFU/catheter segment, e.g., hub or tip) culture, whereby the same organism (species and antibiogram) is isolated from the catheter segment (e.g., hub or tip) and a peripheral source (dialysis circuit or vein) blood sample. If available, the following would be supportive: simultaneous quantitative cultures of blood samples with a ratio of ≥3:1 (catheter hub/tip versus peripheral (dialysis circuit/vein)); differential period of catheter culture versus peripheral BC positivity of 2 hours.

KDOQI 2019

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Of critical importance to each patient facing possible kidney replacement therapy (KRT) is an ESKD life plan. This strategy is about always having a contingency plan for likely "what-ifs." It helps to consider, with one's family and medical care team, what might be the likely changes and likely "what-ifs."