Arteriovenous Fistula Flow Surveillance

KDOQI GUIDELINES

KDOQI Clinical Practice Guidelines for Vascular Access state “Prospective surveillance of AV grafts and fistulas for hemodynamically significant stenosis, when combined with correction, improves patency and decreases the incidence of thrombosis.” The preferred method for stenosis surveillance is direct intra-access flow measurements which include Transonic® ultrasound dilution technology. Transonic® ultrasound dilution technology is the recognized gold standard technology for hemodialysis patient management. The method directly measures vascular access flow to detect flow limiting problems wherever they occur at a vascular access.

FISTULA FIRST: A NATIONAL VASCULAR ACCESS IMPROVEMENT INITIATIVE

Dialysis care providers agree that native arteriovenous fistulas (AVFs) are the preferred vascular access in the appropriate patient population. Compared to arteriovenous grafts (AVGs) and catheters, they exhibit lower rates of complication, longer patency, fewer hospitalizations, lower patient morbidity and incur lower costs. To significantly increase the use of AV fistulas for hemodialysis vascular accesses, the Centers of Medicare and Medicaid Services (CMS) established the Fistula First Initiative. Fistula First has partnered with the 18 ESRD Networks, dialysis providers, nephrologists, vascular access surgeons, interventional radiologists and interventional nephrologists. In tandem with the Fistula First Initiative, the Institute for Healthcare Improvement (IHI) has also developed 11 change concepts based on best practices for increasing AVF use and improving hemodialysis patient outcomes including:

Change Concept #9: Establish Processes for Monitoring and Maintenance to Ensure Adequate Access Function

“the health care team should establish a process for monitoring and maintenance of AV fistulae to ensure adequate access function.”

Early identification of fistula dysfunction and appropriate intervention avoids inadequate dialysis and prolongs AVF survival. Since such early detection is crucial, all dialysis facilities are urged to adopt standard procedures for surveillance to ensure timely referral for failing AVFs.

POSITION STATEMENT: AMERICAN NEPHROLOGY NURSES ASSOCIATION (ANNA)

ANNA endorsed the need for establishing an access surveillance program with the following vascular access position statement: “A routine Access Surveillance Program should be employed to identify and intervene for access dysfunction, to enhance long-term access function and reduce the costs associated with maintenance of access patency. … Access surveillance and management is a multidisciplinary team function. Nephrologists, nephrology nurses, technicians, interventionalists, surgeons, primary care physicians and patients should all be participants of the team.”

INDIRECT PRESSURE MEASUREMENTS

Despite evidence that indirect pressure measurements have limited value for AVF surveillance, some physicians continue to use indirect measures of flow such as dynamic and static venous pressure to detect access dysfunction. The limitations of venous pressure measurements include:

1. Venous pressure measurements cannot detect flow-limiting problems on the arterial inflow or between the dialysis needles where 74% of problems occur in forearm AVFs and 39% of problems occur in upper arm AVFs.
2. Stenoses in AV fistulas tend to occur at areas of vein bifurcation and pressure points. As a result, collateral veins or tributaries develop to drain an AV fistula. These fistula tributaries dissipate pressure in the presence of an outflow obstruction and prevent marked pressure increase.

Dr. Lawrence Spergel, founder of Fistula First, reports, “An absolute Static Intra-Access Pressure Ratio (SIAPR) at any level cannot be used as a surrogate for low Qa or access dysfunction.” The 2004 Kidney International study advises, “Therefore, the current use of absolute K/DOQ SIAPR thresholds for referral based on the presumption that such thresholds are indicative of low Qa associated with stenosis is not justified and should be discontinued.”

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AV Fistula Flow Surveillance Cont.

STENOSIS SITES IN GRAFTS AND FISTULAS

The figures and table below show that the sites of most frequent stenoses depend on the type of access. Figure 1 shows that the majority of stenoses in AV grafts are in the venous outflow. Figures 2 and 3 show that many of the problems in AV fistulas occur in the arterial inflow or between the needles.

![Fig. 1: Sites of stenosis in PTFE Grafts.](image1)
![Fig. 2: Sites of stenoses in forearm AVFs.](image2)
![Fig. 3: Sites of stenoses in upper arm AVFs.](image3)

### Summary of Most Frequent Stenosis Sites

<table>
<thead>
<tr>
<th>AV Access</th>
<th>Arterial Inflow</th>
<th>Between Needles</th>
<th>Venous Outflow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grafts</td>
<td>4%</td>
<td>3%</td>
<td>93%</td>
</tr>
<tr>
<td>Forearm AVF</td>
<td>55%</td>
<td>19%</td>
<td>26%</td>
</tr>
<tr>
<td>Upper Arm AVF</td>
<td>17%</td>
<td>17%</td>
<td>61%</td>
</tr>
</tbody>
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### References:


**TRANSONIC® AV FISTULA SURVEILLANCE**

Higher vascular access flow rates, superior patency and low incidence of infections make arteriovenous fistulas the vascular access of choice for ESRD patients.

Measuring access flow in AV fistulas with the Transonic® Hemodialysis Monitor:
- Extends the life of the fistula.
- Reduces hospitalizations.
- Improves dialysis efficiency.
- Identifies abnormally high flows which can strain the heart and lead to cardiac overload.
- Complies with KDOQI & "Fistula First" guidelines.

Transonic Systems Inc. is a global manufacturer of innovative biomedical measurement equipment. Founded in 1983, Transonic sells “gold standard” transit-time ultrasound flowmeters and monitors for surgical, hemodialysis, pediatric critical care, perfusion, interventional radiology and research applications. In addition, Transonic provides pressure and pressure volume systems, laser Doppler flowmeters and telemetry systems.

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