

Vascular Access Surveillance A Comparison of Flow and Pressure Methods

This paper will present summaries of studies and other documents examining two K/DOQI accepted methods of access site surveillance: access flow measurement and derived static pressure. The highlighted documents can be accessed over the Internet if viewed on-line.

1. Recommendations from the 2006 K/DOQI Guidelines

The current K/DOQI vascular access work group has developed guidelines to improve the care and maintenance of access sites in HD patients. This guideline suggests that both monitoring (physical inspection) and surveillance (use of a device) should be used to detect stenosis. The guideline can be found:

http://www.kidney.org/professionals/KDOQI/guideline_upHD_PD_VA/index.htm. Key and relevant evidence based recommendations from K/DQOI include the following:

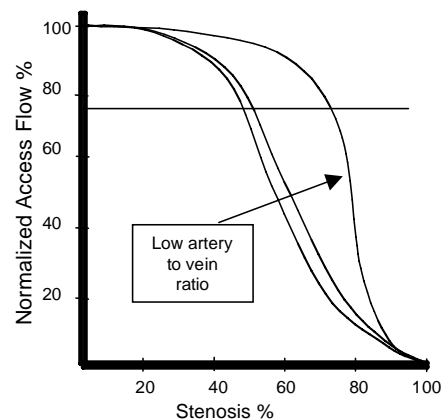
- a. Flow-based technologies (Trasonic and On-Line Flow) and Derived Static Pressure (Vasc-Alert) are approved surveillance methods for determining vascular access dysfunction.
- b. Consistent tracking of all of the surveillance testing results should be part of the dialysis center's Quality Assurance or Continuous Quality Improvement process.
- c. It is important not to react to a single reading *"One should not respond to a single isolated abnormal value. With all techniques, prospective trend analysis of the test parameter has greater power to detect dysfunction than isolated values alone."* (K/DOQI CPG 4.4.1)
- d. With all techniques, prospective trend analysis of the test parameter has greater power to detect dysfunction than isolated values alone.
- e. If you are using flow-based technologies, it is recommended that the test be performed more than once a month. ***"It is not clear that access flow measurements performed at a monthly frequency provide sufficient data stability to make decisions. Until additional studies are performed to determine optimal frequency, more frequent measurements are recommended."*** (K/DOQI CPR 4.2.1)

2. A Physiological Basis for Testing More than Once a Month

A [published paper](#) by Dr. William Paulson suggests that there is a physical basis for the need for more frequent testing than once month.

This paper looks at the relative diameters of the artery supplying the access and draining vein and their influence on the use of flow-based technology to detect stenosis. His findings:

- For patients with very low artery to vein diameter ratios, adequate flow is maintained while stenosis is growing until it reaches a critical point and then it drops very quickly, see graph. A greater than 70% stenosis goes undetected because the reduction in access flow is not greater than 25%.
- This helps to explain why "monthly measurements often fail to warn of thrombosis". *Page 3, column 2, second to last paragraph.*
- The study concludes that flow measurements should be done "at least weekly" in order to catch stenosis that is progressing at a constant rate.



Most centers using flow-based technologies test the access once a month. Vasc-Alert tests the access with every session.

3. Vasc-Alert Compared to Flow-Based Methods

An [independent study](#) compared Vasc-Alert and Trasonic and published at ASN in 2006.

This paper examines the sensitivity of both Vasc-Alert and Trasonic to detect a change in stenosis. It examines 529 interventions and compares the readings taken before to the readings taken after an intervention. The ability to detect change is a marker for the growth of stenosis. Since the fact that an

intervention creates a big change in the occlusion of the stenosis (decreasing the blockage), by presumption, the device that is more sensitive here, will also be more sensitive to detecting the growth of stenosis.

The conclusion is that Vasc-Alert is more sensitive to change in stenosis growth than Transonic. It also suggests that the performance of Transonic might be improved with more frequent measurements than once a month. A [simple explanation](#) of the study is also available.

An [analysis](#) of Transonic and Vasc-Alert results within the same patient population has been performed.

This analysis was internally derived from data provided by a dialysis center, which used both the Vasc-Alert and Transonic devices for a year. While this analysis does not have the same controls as a study, it does support the conclusions that:

- Vasc-Alert identifies more patients with issues, (74% vs. 52%)
- Vasc-Alert identifies patients with issues earlier, (74% vs. 18%)
- When Vasc-Alert alerts earlier, it does so with a longer lead-time. (38 vs. 26 days)

4. Operational Considerations of Both Methods:

	<u>Transonic</u>	<u>On-Line Flow</u>	<u>Vasc-Alert</u>
Type of test	Ultrasound dilution	On-Line Clearance	Derived Static Pressure
Time required of clinical staff in performing test	20-30 minutes per test	10-15 minutes per test	None
Frequency of test <i>2006 K/DOQI CPR 4.2.1 Recommends more than once monthly flow testing</i>	Usually monthly	Usually monthly	Every treatment
Use of device by staff during data collection	Requires trained clinical staff	Requires trained clinical staff	No requirement
Tracking of results	Local computer stores results	Additional time required to record and trend results	Automatic
Require deviation from normal treatment procedures	Yes	Yes	No
Timing of testing during treatment	Recommended during the first 90 minutes of treatment per 2006 K/DOQI Guidelines for Vascular Access	Programmed prior to treatment to initiate 15 minutes into treatment. Test aborted if alarms occur during testing.	Results for any treatment greater than one hour
Cost of surveillance testing	Transonic monitor + annual monitor calibration + labor to perform testing	Special machine module + Twister lines on day of testing + labor to perform testing	Annual subscription fee for fistula and graft patients – no additional labor costs for testing
Possible treatment disruption/extension of treatment time	Yes	Yes	No