

Managing access clotting through online surveillance

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Like many dialysis facilities, our large, urban center was faced with a growing vascular access monitoring problem. Too many patients required urgent access thrombectomies. Daily clinical operations of the unit were often interrupted by the need to deal with clotted accesses. The access “problem” led to a number of downstream consequences: patients were fearful of losing their “life-line,” the Vascular Surgery Access Clinic was spending a disproportionate amount of time on access emergencies, which disrupted and/or delayed scheduled interventions, and the scheduling of emergency thrombectomies increased the placement of temporary catheters, obviating our “Fistula First” initiative.

Although we had extensive experience with ultrasonic techniques for access stenosis detection, we had abandoned such modalities because they are highly operator-dependent. We required a convenient tool that could predict access stenosis. This was provided for us by our divisional engineer and computer systems analyst. They developed an algorithm that closely approximated static venous access pressure, via trend analysis of data that had been routinely and continually collected by the hemodialysis machine in real-time. Increasing pressures indicated the presence of worsening stenosis and warranted access evaluation, e.g., a stenotic lesion was growing and the patient might require access intervention. After successful initial beta testing, the refined algorithm evolved into Vasc-Alert.

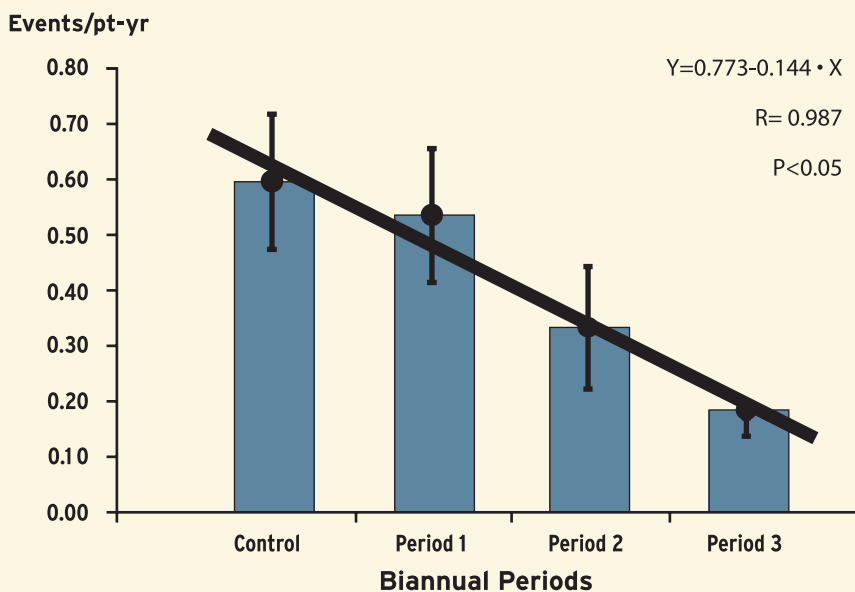
Vasc-Alert generated a simple-to-read warning list of patients with possible access dysfunction and/or impending

stenosis. Listed patients were subsequently checked for factors that supported the diagnosis of vascular stenosis, including physical indications, decreased solute clearance, inability to achieve prescribed pump speed, and prolonged access bleeding. If these or other indicators supported the diagnosis of stenosis, we scheduled the patient immediately for vascular access evaluation and/or intervention.

Further, we have benefited from Vasc-Alert in other ways.

- Emergent temporary catheter placement was substantially reduced. It is almost non-existent in prevalent hemodialysis patients.
- Operational flow-through has improved because of a reduction of access clotting.
- Optimal blood pump speeds are

FIGURE 1: DIALYSIS THROMBIC EVENTS



The thrombosis rate declined significantly (P<0.05) following the introduction of vascular access surveillance with Vasc-Alert in Period 1.

Following this automated process led to dramatic results. After 18 months, we reduced the vascular access incident clotting rate from 0.6 to 0.2 events per patient-year. Now this rate is just over 0.1 events per patient-year (see Fig. 1).

achieved in a larger proportion of patients.

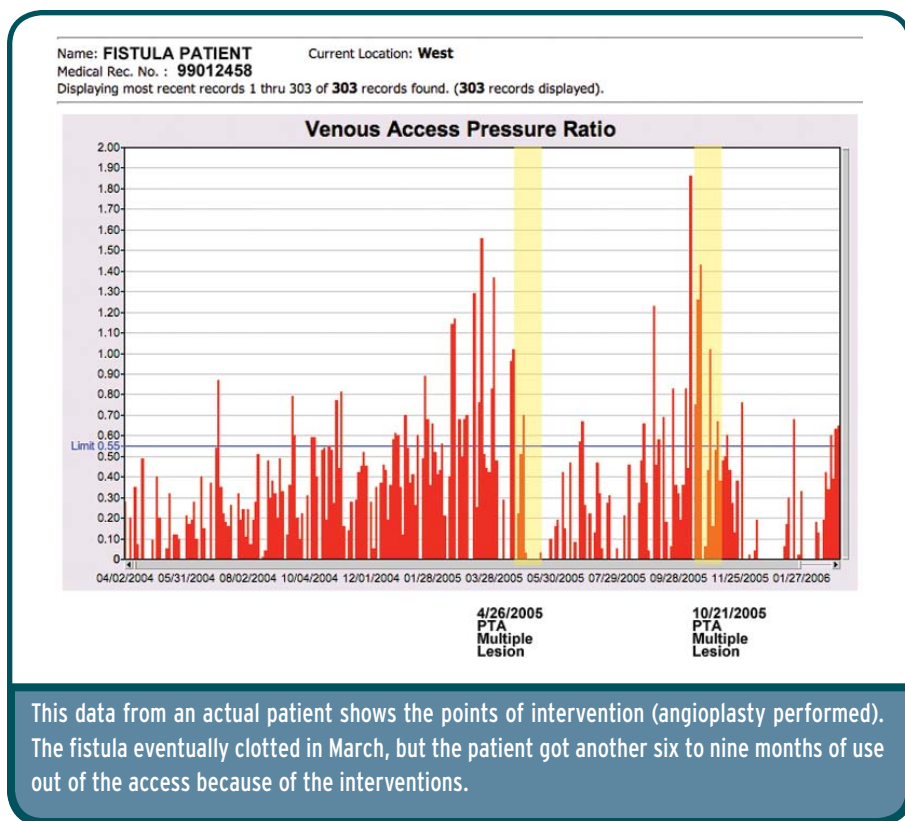
- Patients’ well-being and satisfaction with care are improved because they realize that their accesses are monitored during each treatment.

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- Fewer patients miss their treatments because of access problems, thereby improving unit efficiency.
- Fewer patients experience prolonged access bleeding following successful early access evaluation and intervention.

The Vasc-Alert-based protocol which we presently utilize continues to evolve, as those working with access issues develop a better understanding of its practical application. Vasc-Alert reports prioritize those patients most at-risk for access failure. Currently, we conduct careful physical inspections of vascular accesses and complete an Access Information Sheet for each patient monthly. Key factors we consider are listed. Depending on the analysis of these key parameters (see Table 1), we decide if the patient requires interventional evaluation.

Notably, vascular access Geirges Haddad, MD, observed that seldom does he see a patient from our unit that did not require some form of intervention. "Ninety-nine percent of the time, we see a problem," he said. "The difference between a unit that



This data from an actual patient shows the points of intervention (angioplasty performed). The fistula eventually clotted in March, but the patient got another six to nine months of use out of the access because of the interventions.

uses the Vasc-Alert algorithm and those that don't is significant. It is always better to catch stenosis before clotting because

you run a high risk that you can't reopen it, especially in arteriovenous fistulas.

"I have no doubt that proactive procedures extend the life of the access, even if we have to see them every two to three months. It is much more cost effective to perform a 20 to 30 minute angioplasty on an open access than spending one to two hours doing a thrombectomy that may not succeed. Use of this screening technique has also helped smooth our operations. It is a lot easier to schedule a patient for an intervention than trying to fit in an emergency thrombectomy."

As a nephrology-based physician assistant, I never want to see a patient lose his/her access. It is the patient's lifeline and the consequences of thrombosis are significant. Once an access clots, it may be difficult to salvage. By using Vasc-Alert as a screening tool, we can tightly focus on those patients at higher risk for stenosis or thrombosis and work with them in an organized and efficient manner to proactively treat stenosis, avoiding the requirement of an emergent procedure. ♦

Table 1. Assessing need for intervention

	Yes	No
Dialysis duration, not achieved		
Extremity swelling		
Difficult cannulation		
Prolonged bleeding		
Decrease in Kt/V or URR		
Inability to achieve adequate Qb		
Access warning (increased Vpr)		
Vascular "steal" symptoms or pain		
Signs or symptoms of infection		
Signs or symptoms of infiltration		
Aneurysm formation		
Other		