Increasing AV fistula creation: The AKRON experience

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Abstract

Increasing arteriovenous (AV) fistula creation to more than 50% of patient accesses in a dialysis unit is one of the goals listed in the National Kidney Foundation's Kidney Disease Outcomes Quality Initiative (NKF-K/DOQI). We report increasing AV fistula creation from 30.6% in 2001 to 53.3% in 2002 (P< .001) at one dialysis unit through the implementation of an AV fistula creation program initiated by the Akron, Ohio Vascular Access Management Program. Increases in fistula creation were demonstrated in diabetics (27.8 % to 51.8 %) (P< .001), females (21.3% to 42.3%) (P< .001) and by eight of the 11 vascular access surgeons in Akron. This is one example of what can be achieved by using a team approach in a community-based quality improvement program.

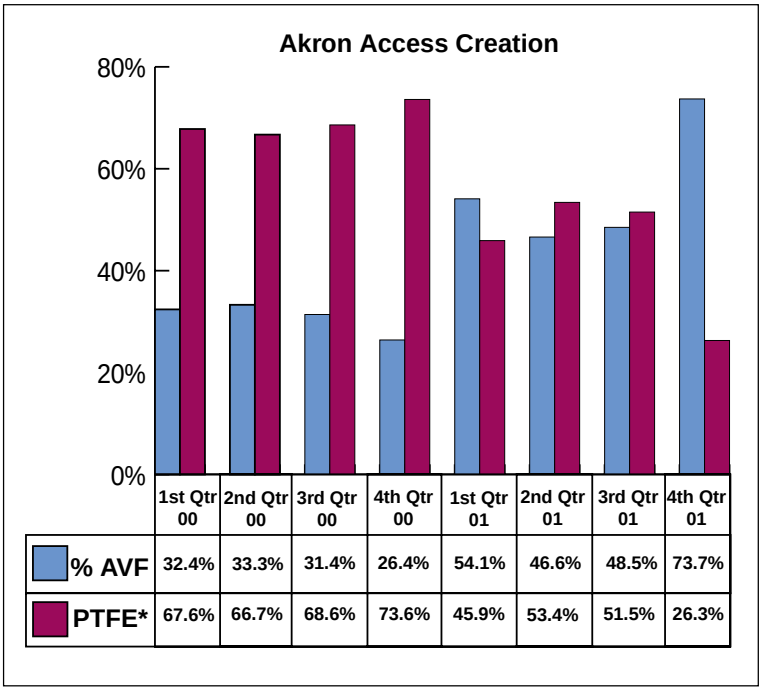
Background

Hemodialysis (HD) access failure is a major source of morbidity and hospitalization for end-stage renal disease (ESRD) patients. The extent of this morbidity varies significantly among the different types of vascular access. A native AV fistula remains the preferred hemodialysis vascular access because AV fistulas have the best long-term patency, lowest complication and lowest infection rate of any available vascular access. In comparison, prosthetic bridge grafts have three to five times the complication, rate of AV fistulas.[1,2] For this reason, the NKF-K/DOQI guidelines[3] recommend that an AV be constructed in at least 50% of all new dialysis patients.

However, since the original publication of the K/DOQI guidelines in 1997, the majority of new access creations in the United States continue to be prosthetic AV bridge grafts.[4] The predominance of AV grafts is generally attributed to a combination of poor quality superficial veins, late surgical referrals, ease of graft insertion, financial incentives favoring graft creation, and surgeon indifference. Fragmented care has also contributed to the difficulties in planning and managing vascular access. In the U.S., the common teaching has been that native AV fistulas are only possible in young patients without diabetes or peripheral vascular disease. If hemodialysis was imminent, an AV graft was the most likely access to be placed. This continued reliance on grafts results in increased vascular access morbidity and increased health care costs.

The Akron Vascular Access Program

The Akron, Ohio, dialysis community consists of approximately 675 hemodialysis patients under the supervision of 12 nephrologists. These patients are treated in nine different outpatient hemodialysis facilities and served by seven different hospitals. Ten vascular surgeons and 12 interventional radiologists also participate in the care of these patients. In the past,



	1st Qtr 00	2nd Qtr 00	3rd Qtr 00	4th Qtr 00	1st Qtr 01	2nd Qtr 01	3rd Qtr 01	4th Qtr 01
% AVF	32.4%	33.3%	31.4%	26.4%	54.1%	46.6%	48.5%	73.7%
PTFE*	67.6%	66.7%	68.6%	73.6%	45.9%	53.4%	51.5%	26.3%

Fig. 1. Use of AV fistulas increased immediately starting in the first quarter of 2001 after initiating an AV fistula creation program.
* polytetrafluoroethylene grafts

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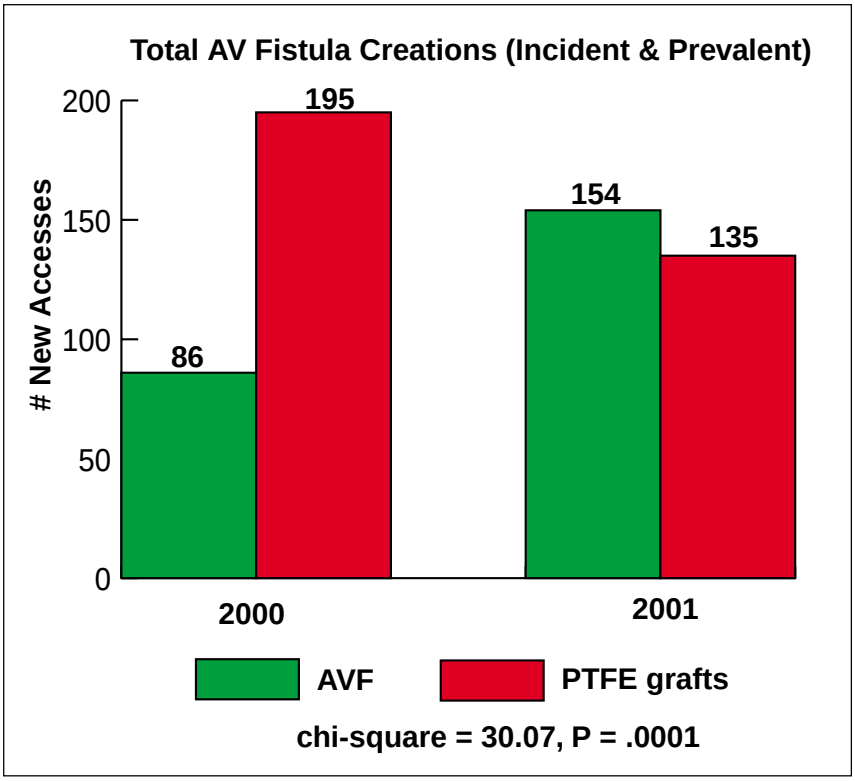

Fig. 2. AV fistula creation increased from 30.6% in 2000 to 53.3% in 2001.

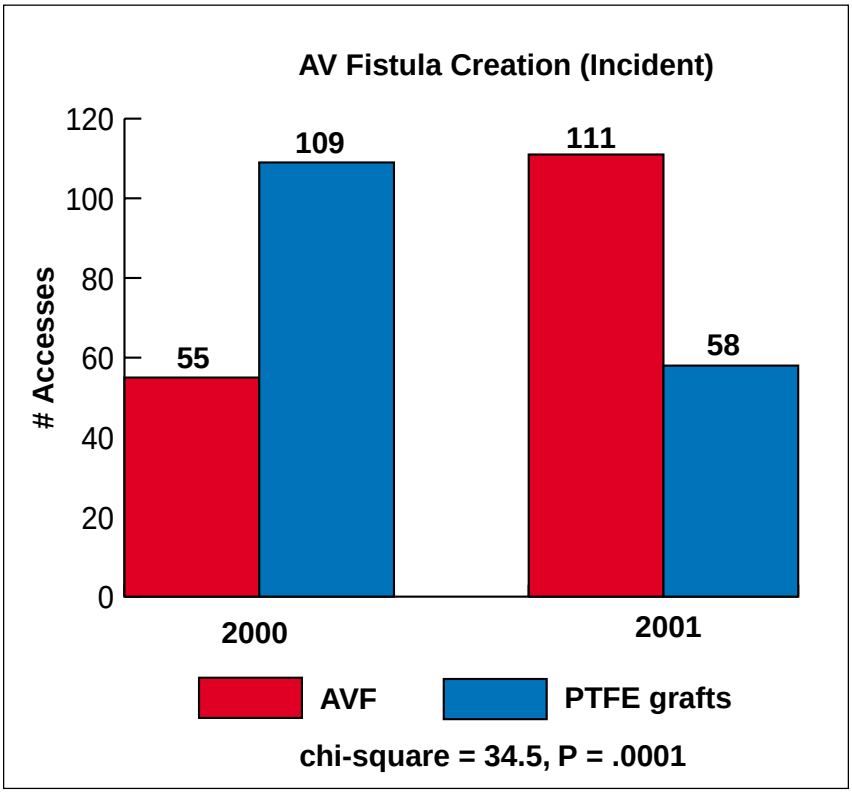

Fig. 3. AV fistula creation increased from 33.5% to 65.7% of first accesses placed.

coordinating access care was difficult.

It was not uncommon to have an access procedure done at one hospital and then find the patient across town for a duplicate procedure one week later. This would occur with little knowledge of what had been done previously. Catheter placements were attempted in sites that had been deemed off limits due to other vascular investigations and procedures (occluded veins, greenfield filter placement, etc.).

In response to the overwhelming difficulty of managing vascular access care, a formal multidisciplinary vascular access team (VAT) was formed in 1997. This team consists of representatives from nephrology, vascular surgery, interventional radiology, and nursing. Key factors for a vascular access management program were identified. First, a nephrologist was appointed to lead the team. Second, a vascular access database was created. Third, a tracking form was developed to communicate all interventions. Finally, a vascular access coordinator was hired. The team felt it was important that an RN coordinate all vascular access-related issues. The vascular access team meets every month to discuss quality improvement, develop formal surveillance and treatment protocols, and review outcome data. The group presents its findings to the whole dialysis community twice a year. All data concerning vascular access procedures and complications is detailed on the vascular form and faxed to the vascular coordinator. It is then placed in the database entry for that particular patient.

AV Fistula Creation

At the end of 2000, preliminary program data revealed that Akron had a low percentage of AV fistula creations (17%) and that fistula rates were not increasing significantly. Certain surgeons had a preponderance of grafts despite the common knowledge and acceptance of the K/DOQI guidelines. The VAT postulated that presenting data comparing local and national trends coupled with the introduction of new methodology would alter behavior and increase fistula creation. We initiated this effort in December 2000 during our citywide vascular access conference. We presented data from programs with AV fistula creation rates of 70%–80%[1,2,5] and contrasted this with data from Akron. We also discussed the use and impact of preoperative imaging to increase successful AV fistula creation [6,7] and the option to create transposed AV fistulas.[8,9]

Methods

We agreed to target increasing AV fistula creation as a goal for our task force in 2001. An emphasis was placed on making data available comparing AV fistula creation by surgeon and dialysis facility in 2000. Vein mapping by Doppler ultrasound (U.S. Vascular Access Centers, Winter Park, Fla.) was initiated for most patients who required a new dialysis access. Patients with upper arm arterial diameters ≥ 2.5 mm without dampening of the waveform, and who had stenosis-free veins ≥ 3.0 mm with continuity with the deep venous system, and who were without central vein stenosis, were considered as potential AV fistula candidates.[6] Catheter patients were reviewed to determine the reason that they did not have an alternative access. Patients without a medical contraindication to access placement were referred for vein mapping. Patients with adequate-sized vasculature were then referred for surgical evaluation for AV fistula creation. Each surgeon's AV fistula creation statistics were provided to them, along with comparisons to the other local access surgeons' statistics (names were not available) on an ongoing basis. Data from 2001 was entered into our ongoing database and was then compared to the historic data from 2000. Categorical variables were compared by chi-square analysis and continuous variables using a student T test (GB Stat 6.5; Dynamic Microsystems, Silver Spring, Md.).

Results

The use of AV fistula increased immediately from the onset of our AV fistula creation program in January 2001. Total AV fistula creation increased from 26.4% (4th Qtr 2000) to 54.1% (1st Qtr 2001). This trend was sustained throughout the year. Initial fourth quarter data showed a further increase to 73.7% (see Fig. 1, pg. 44). On an aggregate basis, total AV fistula creation (including both incident and prevalent patients) increased from 30.6% (86 of 281) in 2000 to 53.3% (154 of 289) ($P < .001$) in 2001 (see Fig. 2, pg. 46). The increase was most dramatic for first accesses in incident patients (33.5% to 65.7%, $P < .001$) (see Fig. 3, pg. 46), but was also seen in subgroups such as females and diabetics that typically have difficulty receiving fistulas (see Figs. 4, 5, pg. 50). Increased fistula creation was displayed by eight of the 11 surgeons placing vascular accesses in Akron (see Fig. 6, pg. 52). Six of the 11 surgeons had a 50% or greater fistula creation rate as compared to only one the previous year. Surgeon #10 showed greatest improvement. His fistula percentage increased from 26.3% to 73.5%. There was no difference in patient age, length of time on dialysis, percentage of diabetics, or patient gender between the two time periods (2000 and 2001).

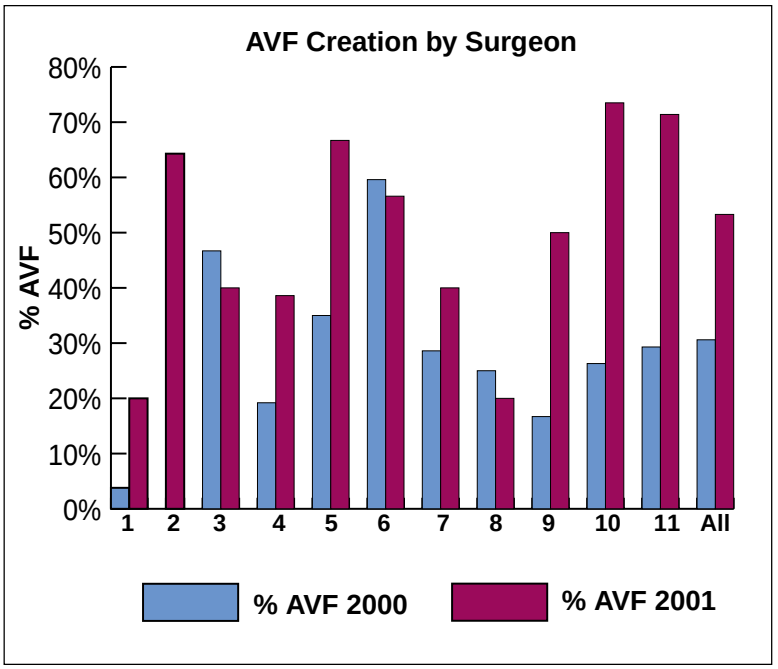

Fig. 6. AV fistula creation increased among eight of the 11 vascular access surgeons in Akron.

Discussion

Increasing AV fistula creation improves the lives of hemodialysis patients by decreasing the incidence of access failure. For this reason, it is a key goal of the K/DOQI and, now, it is a ESRD Network quality improvement project. Numerous preconceptions have limited fistula creation in dialysis patients. Diabetics and the elderly have been felt to have inadequate vasculature and women have been felt to have veins that are too small for successful fistula creation. Late surgical referrals and financial rewards for graft placement also play a role in limiting fistula creation. Lack of individual surgical data made it easy to assume one had optimized the rate of fistula placement and that little could be done to improve current rates.

Changing the practice patterns of Akron's 11 different access surgeons seemed to be an insurmountable task. However, practice patterns were rapidly and dramatically altered. The increase in fistula creation rates was not only statistically significant, but clinically significant as well. This rise shattered many of the common myths concerning access creation; even more diabetics received fistulas.

The question persists: What led to the dramatic rise in fistula placement? Several possibilities may account for this increase. It would be impossible to discount the fact that the question was simply raised and discussed at the citywide conference. However, if this was the case, one would expect a rise and then a subsequent decrease in fistula placement over the following months. To the contrary, we saw an initial and continued rise in AV fistula creation. The VAT did emphasize vein mapping. Although this study did not quantitatively impact vein mapping, it seemed that surgeons routinely ordered preoperatively after the conference. Further emphasis was given to patients labeled as having "exhausted" all native accesses. They were ultrasonically explored with the possibility of creating native vein transpositions. The ultrasounds demonstrated that most patients were potential fistula candidates.

One of the most dramatic, as well as controversial, outcomes was the direct surgical comparison. Not only were the surgeons aware of their AV access history, they were also made aware of

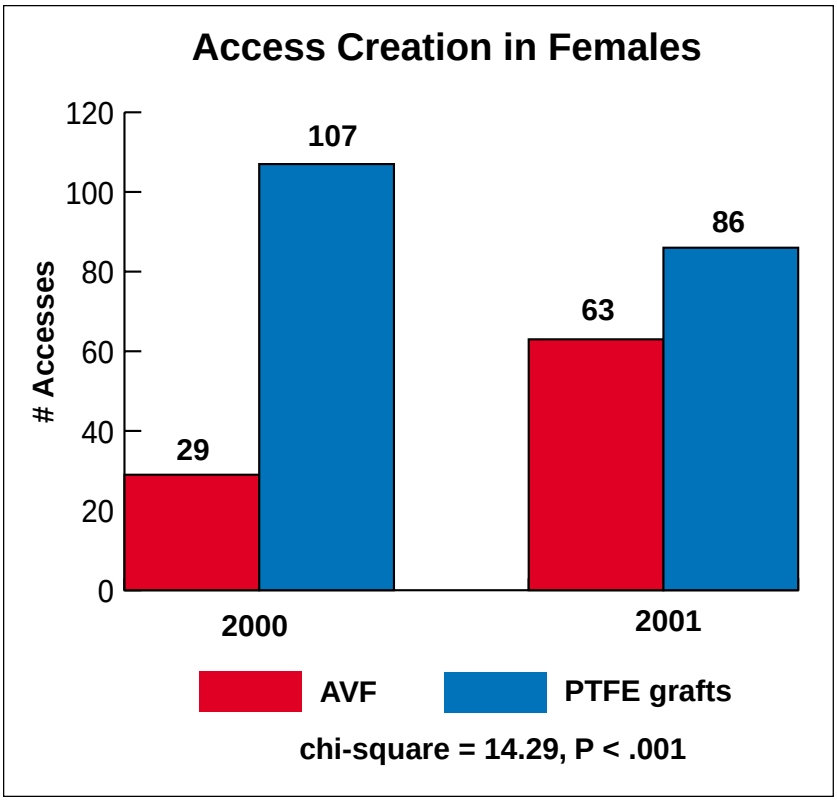

Fig. 4. AV fistula creation in females increased from 21.3% to 42.3%.

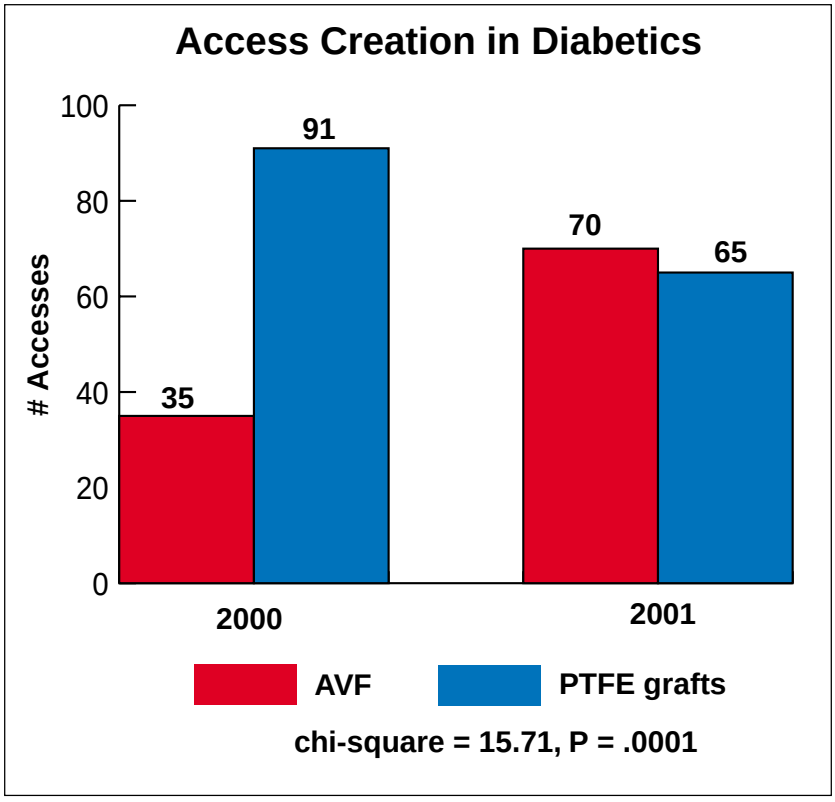

Fig. 5. AV fistula creation in diabetics increased from 27.8% to 51.8%.

the fact that they were going to be continually tracked and compared in the future. This may have had the largest impact on fistula creation.

The ensuing feedback was felt by most of the nephrologists in the community. Surgeons began to request earlier nephrologic referrals. Most were apologetic when there was no choice other than graft placement. Equally important was the camaraderie that developed between the surgeons and the dialysis community. The possibility always exists that this happened by chance; however, the results seemed too dramatic for this to be plausible.

Conclusion

We concluded from this experience that trends could be reversed with effort by a vascular access team. Prior to the formalization of the access management program, our percent of fistula creation had been as low as 17%. Initial efforts aimed at educating the dialysis community on the benefits of fistula creation only increased that rate to 32%. It wasn't until surgeon-and-facility specific data were presented that those practice patterns changed and fistula placement rates quickly grew to 53.3%.

We are very gratified by the successful improvement in AV fistula prevalence in Akron. We have now reached the 50% fistula creation goal cited in K/DOQI. This is one example of what can happen using a team approach in a community-based program.[10,11] Most importantly, the patients benefit. We expect not only to continue to meet K/DOQI guidelines, but also to exceed them. Future efforts will focus on ways to promote fistula maturation, continue increasing AV fistula placement, and improve overall access patency. NN&I

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There is no "*I*" in "*Team*":

Improving vascular access outcomes is a collaborative effort

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Increasing AV fistula prevalence is one example of the opportunities to im prove vascular access out-comes. The Akron experience illustrates the methods generally required to translate established clinical methods (good science) into real world behavioral change (process) and effective outcome improvement. These begin with the use of a multidisciplinary team. The team included a physician champion and utilized a coordinator to maintain day-to-day focus. The team identified a specific opportunity for improvement and defined new clinical pathways based on local experience, the experience in other communities, and review of the literature. A data system provided comparative outcomes measurement and regular feedback. This was coupled with educational efforts specifically targeted to patients, physicians, and nurses. Involvement was extended to all members of the ESRD care team to reinforce the required behavioral changes. The coordinator's interpersonal skills facilitated the involvement of all parties—the surgeons in particular—on an individual basis. The combination of a committed multidisciplinary team, ongoing data collection and analysis, standardization of process and long term focus, coupled with educational efforts and feedback to the entire team, including patients and staff, is the usual prescription for success. This allowed the Akron team to surmount the numerous barriers to improving vascular access outcomes and change Akron from a "graft" to a "fistula" culture.

The success in Akron, however, must be taken in context. Change did not occur overnight. The vascular access team has been in place for approximately two to three years and has been involved in previous vascular access improvement projects, including the evaluation and reduction of infiltrations and a stenosis detection program. Successful involvement of surgeons and increased awareness of vascular access outcomes was achieved gradually over the course of several years through the continuous feedback of data, ongoing education of the entire community, and through daily interactions of physicians, nurses, and patients focused through the vascular team and coordinator. This resulted in a community that was ready to undertake the project of increasing AV fistula creation. This type of progression is typical of successful programs. Vascular access programs generally begin with quality improvement efforts in dialysis facilities and, over a period of time, gradually extend to efforts that require increased involvement of other disciplines, such as surgery and interventional radiology. Team building and trust takes time.

Success in Akron, however, was achieved despite the numerous systemic barriers to improving vascular access outcomes in general, and increasing AV fistula prevalence in particular. Overall improvement will require realignment of incentives to reward fistula creation and decrease the systemic barriers that impede vascular access outcome improvement nationally. Currently there are few organized pre-ESRD programs due to lack of reimbursement, compliance limitations, and inadequate referral. Lack of reimbursement makes preoperative imaging generally unavailable. CMS reimbursement policies reward procedures, favor graft and catheter placement, and fail to provide resources to dialysis facilities to improve the vascular access outcomes. Hospitals, interventionalists, and surgeons remain unaccountable and often profit from the poor outcomes and morbidity that result from their access choices. Educational efforts must be directed at physicians, nurses, and patients alike. The Akron experience shows that despite these barriers successful AV fistula creation can be increased in the U. S., it supports the old adage that "often the reason people fail is because they never start."

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