Editorial: Does vascular access type affect access related costs?

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Be sure to read companion article “The Impact of Risk of Maturation Failure and Access Type on Arteriovenous Access Related Costs” by Kosa et al. DOI: 10.34067/KID.0001062019
Successful treatment of end-stage renal disease (ESRD) with maintenance hemodialysis (HD) is inextricably dependent on reliable access to the bloodstream, typically 3 times a week. The vascular access therefore is the literal “lifeline” for the HD patient. In numerous studies, including a meta-analysis of 62 cohort studies with 586,337 participants, patients dialyzing with an AV fistula have been observed to have less morbidity and mortality. Although AV fistulas are the preferred form of vascular access if they can become functional, they are limited by high rates of nonuse. Specifically, a substantial proportion (20%-60%) of new AV fistulas are never usable for dialysis or require assistance to mature and be functional. In a comparative national study on elderly HD patients, we found that AV grafts were almost twice as likely as AV fistulas to be successfully used for dialysis within 6 months (adjusted OR, 1.86; 95% CI, 1.73-1.99), an intervention to achieve successful use for dialysis was required more frequently in patients with an AV fistula vs those with an AV graft (OR, 2.66; 95% CI 2.26-3.12), and patients receiving an AV fistula had a 2-month longer catheter dependence prior to successful use as compared to AV grafts (p <0.001).

Taking these issues into consideration, Kosa et al. conducted an innovative study comparing the costs of attaining and maintaining patency for AV fistulas as compared to AV grafts among hemodialysis patients. In addition to comparing undifferentiated costs over 1, 3 and 5 years, the authors analyzed AV-access type and risk of failure to mature (FTM) on total costs. Given the higher rates of non-maturation among AV fistulas, this analysis provides a new and perhaps more appropriate (or ‘fair’) basis in which to compare and analyze costs by access type. The authors conclude that median total costs are not associated with AV-access type when the interaction between AV-access type and FTM risk stratum are considered. The authors also found, unsurprisingly, that the costs of attaining and maintaining patency increased with increasing risk of fistula maturation failure at one, three, and five years. Based on these new study findings, Kosa et al. thereby debunk previous studies which have found that AV fistulas are less costly than grafts.

This is an original and thoughtful study that is innovative in its use of the FTM risk tool to stratify costs. More studies such as this one are needed to evaluate the ‘real world’ feasibility of the Fistula First Initiative to help vulnerable patients (i.e., the elderly, diabetics, women, and others) at highest risk of FTM and their providers make better vascular access choices. This study builds on the multitude of recent multi-center vascular access studies (Dialysis Access Consortium Study, Hemodialysis Fistula Maturation Study) that have highlighted the high frequency of unsuccessfully used AV fistulas for dialysis and the requirement for (often multiple) maturation interventions to make the AV fistula functional.

In our 2018 study using contemporary national data from Medicare and the Centers for Medicaid and Medicare Services (CMS) claims to examine the rate and timing of vascular access events and the Medicare costs based on various scenarios of AV fistula function, we determined that per patient per year vascular access costs in 3 years after surgical creation were four times as high as for patients whose AV fistula was not used compared with patients with an AV fistula that did not require an intervention in the first year ($7,871 ± SD $14,183 vs. $31,630 ± SD $103,941, p <0.05). The higher costs associated with non-use or FTM reflect interventions to promote AV fistula maturation, new access surgeries, and complications associated with prolonged exposure to catheters including elevated rates of bacteremia, osteomyelitis and endocarditis. We also found that AV fistula FTM resulted in higher costs for multiple years. A major limitation of our national study was that we did not compare costs between AV fistulas and AV grafts, based on vascular access outcome scenarios. We believe evaluating the costs
based on access type differentiated by vascular access outcomes remains an important research
question that would help in determining whether different patient selection criteria should be used for
permanent access that could affect outcomes or costs. Kosa et al.’s paper is the first to compare AV graft
vs. AV fistula costs directly while also considering important differences in FTM based on access type.

In other work,2 we found that while vascular access events preceding successful use favor AV grafts,
those occurring after successful use favor AV fistulas. These observations, like those in the Kosa et al.
paper, highlight the important tradeoffs of permanent vascular access placement in hemodialysis
patients initiating hemodialysis with a catheter. They suggest the need for a more nuanced approach to
Fistula First recommendations that addresses the tradeoffs of earlier AV graft access use versus longer
AV fistula patency. Ultimately, when considering selection and placement of the best vascular access for
dialysis patients, the clinician is wise to consider the results of this study and to balance the importance
of removing the catheter and minimizing the need for interventions to make the vascular access
functional (favoring AV graft placement) versus a longer lasting vascular access with fewer maintenance
interventions (favoring AV fistula placement).

There are some important limitations of this study. One, the study was conducted over a long time
period – 2002 to 2018 – that could possibly have affected the cost outcomes. Could there be a bias
towards AV graft or AV fistula given advances during this time period in either the access technology
and/or improved surgical techniques? Notably, the authors did find that year of creation was negatively
associated with cost, suggesting that “more recent advances in technologies and strategies to inform
vascular access placement may have been effective in reducing AV access related costs over time”.
Second, the study would have been stronger if additional cost data was collected related to secondary
patency loss (abandonment) or subsequent costs of a catheter and/or new vascular access insertion.
Unfortunately, the endpoint that was chosen was ‘end date of the patients’ primary AV-access during
study period,’ instead of continuing to collect vascular access-related information and costs through year
1, year 3 and year 5. Third, the analysis was conducted based on the experience of a single institution in
Canada and thus does not necessarily reflect the experience of other jurisdictions or the national
experience in Canada or in other countries.

Despite recognition of the complexities associated with vascular access creation and use, few studies
have evaluated the disparate costs related to AV fistula management in a representative HD population
and even fewer have compared AV graft to AV fistula in this regard. AV fistulas remain the preferred
form of vascular access and are incentivized by CMS in Fistula First, Quality Incentive Program, and 5-
Star programs. The CMS, the principal payer of dialysis services in the United States, has actively
promoted use of AV fistulas with the twin goals of improving health outcomes and lowering costs. Kosa
et al.’s study suggests that both outcomes and costs are related to accurately predicting patients in
whom the AV fistula is likely to have unsuccessful use for dialysis, therefore determining with greater
confidence who may be better suited to undergo AV graft placement. In other words, the findings of
this study “highlight the need for careful consideration of vascular access choice based on the patient’s
risk of fistula maturation failure from not only a clinical but also an economic standpoint.” But,
predicting who is at risk for permanent vascular access non-maturation is only as good as the tools
available. The FTM risk score used in the Kosa et al. study has been validated previously, but the authors
admit that 1) other risk factors such as need for an urgent start on dialysis might be important to adjust
for in future analyses to minimize the bias in outcomes and costs; and 2) the FTM risk equation was
developed prior to the use of many modern surgical techniques and maturation assisting procedures
and requires further validation in more current samples. To this author’s knowledge, no other predictive risk score exists to address this important problem of stratifying patients in terms of maturation risk prior to the selection of a permanent access. More effort is needed to further validate and update the FTM risk equation or develop new competing risk scores that are integrated into routine nephrology clinical practice.

Finally, at the heart of this issue is the lack of information about why such a large proportion of fistulas (nearly half in many studies) are created but never used. Identifying the causes of the high levels of AV fistula nonuse (e.g., failed maturation and patient refusal) would be important to mitigate the large economic impact found in this analysis and others. In summary, there remains a burgeoning unmet clinical need for improving outcomes and reducing avoidable costs after vascular access creation by better surgical techniques, new vascular access technologies and improved patient selection.