The Burden of Harm—What Is the Ideal Vascular Access for Home Hemodialysis?

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Vascular access complications remain an important cause of morbidity and mortality in patients on hemodialysis (HD) (1,2). Although central venous catheter (CVC) use increases the risk of mortality and infection in patients on conventional in-center HD compared with arteriovenous (AV) access, there are limited data evaluating if a similar association exists in patients undergoing home HD (3,4). In fact, patients on home HD represent a different population: often younger with fewer comorbidities (5). Furthermore, there are emerging studies suggesting an increased risk of AV access complications in patients undergoing frequent HD (6). Given the potential higher complications with AV access in patients on frequent/home HD, it is logical to hypothesize that the risk with CVC use in frequent home HD will differ from that in conventional HD. Moreover, considering that CVC use may increase home HD eligibility in certain patients, especially those with fear of self-cannulation (7), it is important to determine the effect of CVC use on adverse outcomes in home HD.

In this issue of the Clinical Journal of the American Society of Nephrology, Rivara et al. (8) performed an observational study examining the association of vascular access type with all-cause mortality, hospitalization, and transfer to in-center HD in patients on home HD using a multicenter cohort from 464 facilities in the United States. Compared with a propensity score–matched cohort, CVC use in patients on home HD was associated with a greater risk for mortality and hospitalization, but there was no significant association with technique failure. These results were similar in the unadjusted model, although attenuated after adjustment for potential confounders. Using another propensity-matched cohort of patients on conventional in-center HD from the same facilities, Rivara et al. (8) showed elevated risk for death and hospitalization and a higher risk of bacteremia associated with CVC use. Analogous to patients on in-center HD, treatment with a CVC is associated with worse outcomes in home HD.

This study examined the largest United States cohort to determine vascular access outcomes in home HD (8). Moreover, the use of propensity score–matched cohort analyses minimizes potential bias. The availability of a control group of propensity-matched patients on in-center HD allowed for a more robust comparison.

However, how should the results be interpreted? What is the most appropriate estimate of risk, especially given that frequent home HD has multiple confounders, namely differences in operator, cannulation technique, and frequency of treatment?

Given the observational nature of the study by Rivara et al. (8), several limitations must be addressed. It is interesting to note that the mean number of weekly home HD treatments was four, with a median home HD treatment time of approximately 3 hours. However, the practice of home HD varies considerably worldwide in terms of treatment duration and frequency, with some centers prescribing up to six or seven treatments per week. In fact, the Frequent Hemodialysis Network Trial showed an increased risk of access-related complications with AV access (need for repair, access-related hospitalization, or loss of access) in patients on frequent HD undergoing dialysis six times per week (6). Although the patients included in this study were undergoing dialysis treatment at home, it is difficult to ascertain whether these patients truly differed from patients on conventional thrice weekly in-center HD given similar frequency of treatments (8). It is equally important to consider that the true treatment frequency in these patients could potentially differ from the prescribed time given the operator dependence, which could possibly even further attenuate the differences between these two groups.

One should also be aware that this analysis examined outcomes on the basis of the initial documented vascular access, as well as time-varying exposure which yielded similar results. It is well known that vascular access type may change over time, especially during the initial period after dialysis initiation (8). In fact, the study mentioned that, in patients who initiated home HD with a CVC, >50% had switched to an AV access after 1 year (8). Moreover, even if a propensity score–matched cohort was used, residual confounding likely persists, especially given the multiple various potential reasons for CVC use. Indeed, in patients who initiated HD with a CVC, there may be a higher proportion of patients with unplanned suboptimal dialysis initiation, with unmeasured patient characteristics leading to increased risk beyond the risk conferred by vascular access type (9). Furthermore, cannulation technique for AV access has equally been shown to be an important risk modifier, a risk that is not examined in...
this study. More recently, a systematic review by Wong et al. (10) indicated that buttonhole cannulation was associated with increased infection risk.

Lastly, how can one determine the true exposure risk in patients on home HD, especially when it comes to vascular access–related complications? In fact, the higher risk of vascular access complications should occur mostly consequent to the number of times when the access was actually being used for dialysis. How does one accurately compare the risk of vascular access complications in a patient with AV access use six times per week and a patient with use thrice weekly? Studies frequently report event rate using patient-years or patient-months as a denominator with subsequent regression analyses. However, should one take into account the true days at risk in these different patients using their actual exposure of HD?

One could not be faulted in wondering if this study by Rivara et al. (8) truly addressed the vascular access risk associated with increased frequency rather than a home versus in-center comparison in patients with similar dialysis prescriptions. Moreover, the lack of information regarding cannulation technique also limits interpretation of results. It would be interesting to examine an international multicenter analysis that accounts for different home HD practices, cannulation techniques, and prescriptions to accurately investigate the risk of vascular access type in home HD. The precise estimation of vascular access risk will form the foundation to identify potential interventions to reduce these associated risks (11).

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References

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