

Remote Patient Monitoring: An Important Tool in Advancing Home Dialysis

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On July 10, 2019, President Trump issued an executive order to increase home dialysis and transplant utilization, with a target of 80% by 2030.¹ This will be a monumental task given that our current rate of incident

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home dialysis patients sits at 10% and <3% of incident patients receive a pre-emptive transplant. Given these numbers, any and all possible solutions to improving home dialysis uptake in the general population will be needed. One promising technological advance for improving home dialysis uptake is remote patient monitoring. Remote patient monitoring could increase home dialysis use by decreasing some of the burden of home dialysis, improving the patient experience, and diminishing both patient and provider hesitancy with home dialysis.

Determining the elements of remote monitoring that can improve home dialysis uptake and retention is a priority. In this issue of *Kidney Medicine*, Subramanian et al² report the results of their qualitative study of patient, care partner, and clinician perceptions and priorities for remote patient monitoring in home dialysis. This report highlights direct feedback from patients and providers regarding the benefits and the remaining challenges associated with remote monitoring. This study largely focused on what it would mean for patients already doing home dialysis. However, could this technology help increase home dialysis use and convince patients not on home dialysis?

To dramatically increase home dialysis use, nephrologists need to stop offering home dialysis to only patients whom they believe are “good” home dialysis candidates. This medical paternalism deprives patients of choice. More often than not, the reasoning for not encouraging home dialysis is a surmountable barrier that could be overcome, often with fairly minimal effort. As such, all patients should be offered home dialysis after appropriate modalities education. As one provider noted in this article, “What I think we’ve shown, over and over again, is that our judgment of who’s a good candidate or not is really poor.”^{2(p 10)}

Critically, in giving all patients the opportunity to try home dialysis, there is a real risk for increasing technique failure rates and worsened outcomes in the absence of proactive monitoring. Remote monitoring provides an opportunity for providers to feel more comfortable offering home dialysis therapies to patients previously deemed unacceptable candidates because they will be able to more closely monitor patients and thus may improve uptake and retention. Furthermore, when offered the opportunity to do home dialysis, many patients and their care

partners may have reservations about assuming this responsibility. Accordingly, from the patient perspective, offering remote monitoring may provide needed comfort at the onset when deciding between home and in-center dialysis modalities. This concept is supported by this study, with patients discussing the need for frequent formal support that can be provided with remote monitoring. Additionally, patients noted that they had increased comfort with the knowledge that their physician was receiving dialysis information in real time, allowing for more efficient and timely adjustments in their care instead of waiting until the monthly clinic visit.

To increase the prevalence of home dialysis, not only do more patients need to start home dialysis, but also technique failure needs to decrease. Technique failure rates in peritoneal dialysis are 27 per 100 patient-years in the first year,³ with the majority of technique failure events occurring within the first 6 months of therapy. Technique failure in home hemodialysis in one study was 13.2/100 patient-years.⁴ Peritonitis is a leading cause of patients discontinuing peritoneal dialysis and transferring back to hemodialysis.⁵

Could remote monitoring help improve technique survival? Nx2Me is an asynchronous remote telehealth platform for home hemodialysis patients for treatment and vital sign monitoring. Weinhandl and Collins⁶ showed that the use of Nx2Me in home hemodialysis patients was associated with improved attrition rates,⁶ while Lew et al⁷ showed that remote monitoring of weight in patients treated with peritoneal dialysis was associated with lower hospitalization rates. This supports the notion that remote monitoring could improve outcomes and reduce technique failure rates in the home dialysis population.

As with any dialysis modality, education is a vital component in patient management and improving technique survival. Remote monitoring may improve the ability to educate patients at the time of an alert value by facilitating communication between the patient and the nurse. As noted in this study, patients believed that remote monitoring provided an extra layer of support that allowed for more effective communication and subsequently helped them to feel more empowered about their care. Interestingly, a study involving remote monitoring of blood pressure in nondialysis patients showed that blood pressure improvements persisted for 12 months after remote monitoring stopped. A large portion of this is likely due to repetitive training during times of alert values resulting in changes in patient behavior.

Improving patient quality of life and reducing burden of disease may improve technique failure and improve home dialysis uptake. Despite the benefit of not needing to

travel to a dialysis unit 3 times per week, travel is still a necessity for many home dialysis patients. Although a monthly visit is better than thrice-weekly visits, travel may still prove burdensome to many patients. Providers noted in this study a desire to have their monthly clinic visits remotely, stating how that could improve their home dialysis experience. Given improvements in technology and changes in regulations, wider use of telehealth is now permissible in the United States, with the 2018 Bipartisan Budget Act allowing Medicare to reimburse a monthly comprehensive telehealth visit that can occur twice in a 3-month cycle for home dialysis patients.⁸ For example, at the University of Alabama at Birmingham, patients living remotely are seen in a remote medical facility equipped with telehealth for 2 of every 3 monthly visits. During these remote visits, laboratory results and flow sheets are reviewed and full physical examination, including auscultatory examination, is performed. There remains the need to arrange for once-monthly laboratory work to be done, posing some operational barriers. However, remote monitoring coupled with a mechanism to check laboratory results would reduce the need for monthly in-person visits for home dialysis patients.

Although the information provided in this qualitative study provides great insight into both patient and provider experience with remote monitoring, it does not address the fundamental question of who should be monitored or what should be monitored. Given the high risk for early technique failure data, every home dialysis patient should be monitored for 6 months after initiation. After this period, it is unclear who should be monitored and for how long. If all patients are monitored indefinitely, there could be data overload for nursing staff and nursing burnout, which could paradoxically worsen patient outcomes. In the study by Subramanian et al, at least 1 patient was concerned about increased micromanaging occurring after patients feel self-sufficient in their therapy. Ultimately, it is safe to conclude that much more work is needed to determine which patients in the home dialysis population would benefit most from remote monitoring.

While remote monitoring should play a role in addressing the goal set by the recent executive order for all these reasons, there is much refinement that is needed in implementation of remote monitoring to achieve the best results. Both by increasing the comfort of patients and their care partners when learning about home dialysis in education sessions and by reducing technique failure by facilitating real-time interventions, remote monitoring can play a critical role in increasing the number of incident and prevalent home dialysis patients. Programs will need to start by implementing remote monitoring and then improve the process through iterative learning based on patient, nursing, and physician feedback and review of outcomes data.

Technology will be part of the process in improving home dialysis uptake but will not be sufficient alone. We must not lose sight of the basic infrastructure needs for the provision of home dialysis that must be addressed. These

include increasing the number of surgeons trained to place and revise peritoneal dialysis catheters, increasing the number of hospitals able to care for complications of home dialysis therapy, increasing nursing home readiness for home dialysis, increasing dialysis solution production and developing and implementing technologies for online fluid production, and facilitating assisted home dialysis. There is a long road ahead to increase home dialysis use and remote monitoring will absolutely be a part of that process.

ARTICLE INFORMATION

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