

# Why are we Not Getting More Patients onto Peritoneal Dialysis? Observations From the United States with Global Implications



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Peritoneal dialysis (PD) offers lifestyle advantages over in-center hemodialysis (HD) and is less costly. However, in the United States, less than 12% of end-stage kidney disease (ESKD) patients are maintained on this modality. In this brief review, we discuss some of the factors underlying the low prevalence of PD. These include inadequate patient education, a shortage of sufficiently well-trained medical and nursing personnel, absence of infrastructure to support urgent start PD, and lack of support for assisted PD, among other factors. Understanding and addressing these various issues may help increase the prevalence of PD in the United States and globally.

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There has recently been a drive to expand the utilization of home dialysis (both PD and home HD) in the United States. This push has developed for several reasons. First, the United States has lagged behind other high-resource countries, such as Canada, Sweden, Hong Kong, the Netherlands, etc., in expanding home dialysis utilization. Second, several investigators have suggested that, of the kidney replacement therapies (KRTs) available for patients with advanced chronic kidney disease (CKD), in-center HD offers the least attractive option from the patient's perspective, in terms of the negative impact on patients' lives and health related quality of life.<sup>1,2</sup> Third, the increasing cost of caring for patients with ESKD has focused attention on strategies to curtail costs; several studies have shown that the global cost of ESKD care is significantly lower for patients maintained on home versus in-center dialysis.<sup>3,4</sup> Fourth, the shortage of nurses, which has presented staffing problems for in-center dialysis units, has encouraged facilities to expand home dialysis, particularly PD, for which nurse to patient ratios can be significantly lower than in in-center HD units. These reasons contributed in

large part to the US government's proposal in 2019 (as part of the Trump Administration's "Advancing American Kidney Health" executive order) that by 2025, 80% of patients with ESKD should be treated with home dialysis or transplantation<sup>5</sup> (a goal that is generally felt to be unrealistic). In response to this initiative, the American Society of Nephrology created a Home Dialysis Task Force in 2021 to expand the use of and access to home dialysis. The push to expand home dialysis as a way of offering ESKD therapies to a broader population in both higher-resource and lower-resource countries at a lower cost was also recognized by the International Society of Nephrology, which has recently organized an important initiative emphasizing the growth of home therapies for patients on ESKD.<sup>6</sup> Indeed, according to the most recent United States Renal Data System report (2022), the incidence of patients starting PD approximately doubled between 2010 and 2020. However, due to losses to death, transplantation, and transfer to HD, the prevalence of PD has grown only modestly since 2010, from 7.9% of total dialysis patients to 11.7%.<sup>7</sup> This gives rise to the question posed by the title of this article: why are we not getting more patients onto PD? In attempting to address this question, we shall examine several factors: those related to the patient, to medical personnel, to medical facilities, and to demographic factors. Our analysis will focus on conditions in the United States with which we are most familiar.

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Extrapolating therefrom, we will then expand the discussion to include global implications of these observations.

### Patient Factors

Perhaps the most important question to be addressed is: if patients are given unbiased and appropriate education, what percent of patients needing KRT would opt for home therapies? Data from Hong Kong and Thailand, which have PD first policies, suggest that the vast majority of patients on ESKD can be trained and maintained on PD.<sup>8,9</sup> However, if patients are provided appropriate education and given a free choice of treatment modality, what would they choose? Countries with better developed CKD education programs than the United States, such as the Netherlands and Canada, have achieved a higher degree of home dialysis penetration. In Canada, 75% of dialysis patients are maintained on in-center dialysis, 20% on PD and 5% on home HD.<sup>10</sup> In the Netherlands, the percentages are 80%, 16%, and 4%, respectively.<sup>7</sup> However, it is important to keep in mind that there are major differences in ESKD care in these countries compared to the United States. Most importantly, the incidence rates for ESKD are substantially higher in the United States than in any other country in the world except Taiwan and are nearly 2 fold and 4 fold higher than in Canada and the Netherlands, respectively.<sup>7</sup> The impact of the higher incidence rate in the United States on modality choice needs further study; however, the higher numbers choosing in-center HD likely is a result of a variety of factors, including the relative paucity of palliative care options in the United State<sup>11</sup> culminating in the greater use of dialytic therapy for frail, elderly patients with multiple comorbidities (who are poor candidates for home dialysis) in this country. However, even in the United States there is data indicating that a concerted effort to improve predialysis education does result in increased use of PD.<sup>12,13</sup> For example, in a study conducted at Satellite WellBound clinics, 986 patients with impending needs for KRT therapy were provided intensive and comprehensive education regarding their therapeutic options; 36% of these patients initiated therapy with PD.<sup>13</sup>

A major challenge is how to deliver CKD education concerning modality selection in an unbiased and effective way, not only as part of standard CKD education but also for patients who present with advanced CKD and need to start dialysis urgently. Data that is important to convey to patients includes data on mortality, complications of therapy, and impact on the patients' quality of life. There is general agreement that mortality of patients maintained on PD and in-center HD are approximately the same and have gradually

improved for both modalities over the past several years as a result of a variety of improvements in therapies and a better understanding of complications of treatment. Comparative data on quality of life with the different treatments is more difficult to evaluate in large part because of a lack of randomized trials to compare the impact of treatment on patients' lives and problems in accurately assessing quality of life. Many clinicians feel that a patient's perception of the dialysis experience is individual and unique, and that generic quality of life data may not be applicable for an individual patient. However, data that is available suggests that when comparing scores on standard instruments to assess health related quality of life, such as the 36-item short form health survey and the 36-item kidney disease quality of life, the scores are similar for PD and in-center HD patients,<sup>2</sup> whereas the burden of kidney disease score and perceptions of the negative impact of treatment on lifestyle are more favorable for patients on PD.<sup>14</sup> Additional advantages of PD therapy should be emphasized, including the better preservation of residual kidney function in patients receiving PD versus HD,<sup>15,16</sup> which permits patients to be adequately maintained on PD therapy with simpler treatment regimens, such as omitting 1 or 2 days of treatment per week or limiting the number of exchanges per day.<sup>17</sup> These benefits of PD should be stressed when discussing options for KRT therapy with patients and their families. This education should be provided by utilizing vetted, objective information in the form of written material, on the web, or as interactive education sessions, ideally in the patient's native language.

It should be noted as well that even patients who might choose PD as their preferred modality may instead end up starting HD if they experience a sudden deterioration in kidney function before the PD catheter has been placed.<sup>18</sup> The ability to implement urgent start PD would serve to minimize these occurrences. However, many PD programs have yet to overcome barriers to the implementation of urgent start PD.<sup>19</sup> These include a lack of adequate resources to develop an urgent start program, such as inability to have PD catheters placed on short notice, lack of space for training and performance of urgent start PD, and lack of appropriately trained personnel.

Another potential barrier to recruitment of patients on PD relates to the increasing average age of incident patients on ESKD.<sup>7</sup> Many of these elderly patients have physical and/or cognitive comorbidities that limit their ability to engage in a self-care modality. Whereas, in many other countries, a substantial number of such patients engage in shared decision making with their providers and opt for conservative kidney care in lieu of dialysis, education regarding this support system, and

therefore its implementation, is not prevalent in the United States.<sup>20</sup> In the United States, these individuals commonly perform in-center HD and are generally excluded from consideration for home PD. There is another model however- assisted PD- that has been successfully implemented in several countries including Denmark, France, the United Kingdom, Thailand, and Canada.<sup>21</sup> In this model, a trained individual is paid to assist in the performance of PD in the patient's home. This may be a family member or a health care worker, though not necessarily a specialized home dialysis nurse. Support may be provided for continuous ambulatory PD and/or automated PD. Published data indicate that peritonitis incidence is similar to that of self-performed PD as are technique and patient survival.<sup>22,23</sup> The cost of providing assisted PD is no greater than that of in-center HD.<sup>22</sup> A recent small demonstration project supported the feasibility of implementing assisted PD in the United States.<sup>24</sup> Interestingly, the median duration of time for which support was required was only 17 days, and 94% of the patients were able to transition to self-care PD. Assisted PD might be the treatment of choice for the elderly or frail patient wishing to pursue KRT; larger studies are needed to further define the advantages and possible pitfalls of this approach; however, it is one that should be carefully examined.

Two other factors are worthy of examination: the prevalence of automated PD and the degree of utilization of incremental PD. Of the 6 countries studied in the Peritoneal Dialysis Outcomes and Practice Patterns Study the prevalence of automated PD was highest in the United States at 83%.<sup>25</sup> Automated PD requires training on a machine and necessitates that the patient be "tethered" in place for several hours, generally overnight. Both of these considerations may be off-putting to some patients, particularly the elderly. Greater use of continuous ambulatory PD- or assisted PD- might attract more patients to use PD. Another factor to consider is the increased use of incremental dialysis, particularly by starting patients who still have residual kidney function with 1 or more days weekly on which PD is not performed or by limiting the number of exchanges per day.<sup>26,27</sup> This too might entice more patients to start PD knowing that they will not be burdened with performance of dialysis every day of the week or that they can do a limited number of exchanges per day (or night). Another strategy that may encourage a broader utilization of home dialysis in general, and PD in particular, is the utilization of transitional care dialysis units. A transitional care dialysis unit consists of dedicated space within a chronic (or hospital-based acute) HD unit in which the new patient is educated about, and exposed to, various dialytic modalities.<sup>28,29</sup> With a lower patient to staff ratio, personnel in these

units are able to give more attention to the psychosocial needs of the new dialysis patient and help support and facilitate a transition to self-care if the patient desires to do so.

### Medical Personnel

Another barrier to increasing the penetrance of PD is the lack of appropriately trained medical professionals, both physicians and nurses. A survey of renal fellows in the United States published in 2002 demonstrated that, whereas the average fellow in training cared for 31 to 40 patients on HD, they provided care for only 5 to 8 patients on PD, and 29% of US trainees cared for fewer than 5 patients on PD.<sup>30</sup> Furthermore, a subsequent study from the United States reported that 25% of second year nephrology trainees had no exposure whatsoever to outpatient PD.<sup>31</sup> Although this situation has improved somewhat over time, as recently as 2020, only 11% of US trainees surveyed reported feeling fully prepared to care for patients on PD, 62% of trainees reported feeling moderately prepared to do so, and 27% of respondents felt only minimally prepared to provide care for patients on PD.<sup>32</sup> Similarly, in a very recent survey, only 72% of nephrology training program directors believe that every fellow graduating from their program is capable of providing PD care without supervision.<sup>33</sup> There are courses in the United States that are targeted at increasing knowledge of home dialysis therapies, for example, the Home Dialysis University sponsored by the International Society for Peritoneal Dialysis. The American Society of Nephrology has very recently partnered with the Home Dialysis University to offer a limited number of scholarships to support nephrology trainees to attend this course; the long-term impact of this remains to be determined.

Compounding the lack of trained physicians is the lack of sufficiently well-trained home dialysis nurses.<sup>34</sup> This is part of the larger problem of a shortage of dialysis nurses in general, believed to be due, at least in part, to the stressful nature of the profession.<sup>35</sup>

### Medical Facilities

The United States is the only Western country in the world where over 90% of dialysis units are owned and operated by for-profit companies. HD units are often opened by several competing companies in cities and suburban locations (often in close proximity), offering patients convenient, short commutes to dialysis centers. However, though competing units may offer benefits to patients, they also need to generate adequate censuses to insure profitability. This results in a disincentive for the dialysis companies to promote home dialysis therapies. A similar disincentive at the

physician level may arise if the physician is financially involved in a joint venture with the dialysis provider.

Another concern regarding medical facilities in the United States is the small size of their PD programs. The median size of PD programs in the United States ranges from just 8 to 14 patients.<sup>36</sup> Small programs such as this are not cost-effective and, more importantly, are associated with inferior outcomes, that is, more death and poorer technique survival with more patient transfers to HD.<sup>36,37</sup> Consolidation of multiple small programs in a given geographic region into larger single centers would result in greater PD retention and thus, overall growth in the prevalence of PD. It should be noted, that even if this required patients to travel a little farther, the recent implementation of telehealth as an acceptable and reimbursable avenue for patient monitoring for two-thirds of monthly patient visits mitigates much of this potential inconvenience.<sup>38</sup>

To encourage the growth of home therapies, the Centers for Medicare and Medicaid Services introduced the [End-Stage Renal Disease Treatment Choices](#) model in 2019, which created financial incentives for dialysis facilities and nephrologists to drive home dialysis utilization (as well as kidney transplantation) by increasing reimbursement for home dialysis and adjusting reimbursement rates for home and facility dialysis based on the rate of home dialysis and transplantation, a performance payment adjustment.<sup>7</sup> The assumption for this initiative is that financial rewards are needed to incentivize the expansion of home dialysis utilization. Does this raise ethical issues? The impact of the End-Stage Renal Disease Treatment Choices model was then studied in a mandatory participation randomized clinical trial with selected facilities enrolled in the End-Stage Renal Disease Treatment Choices programs and others not. Surprisingly, this study found that home dialysis increased to a similar extent in facilities that were enrolled in the End-Stage Renal Disease Treatment Choices payment adjustments as in those that served as controls, with home dialysis training increasing to 14%–15% of adult incident patients on ESKD in both groups.<sup>39</sup> Encouragingly, these findings suggest that encouragement and expansion of home therapies seem to be developing independent of financial incentives.

### Demographic Issues

As the nephrology community evaluates the impact of the government's initiatives to grow home therapies, it is interesting to consider what numbers should be tabulated to evaluate the impact of policy decisions and educational programs. For example, the 2022 US Renal Data System data base points out that only 13.3% of incident dialysis patients start on home therapy; however, 19.4% are maintained at home after 1 year

(indicating that many patients are trained for home therapy after starting in-center HD). Yet, only 13.7% of prevalent patients are on home dialysis. This may be explained by the observation that by 1 and 2 years after the start of PD, 14.6% and 23.7% of patients on PD, respectively, have transferred to in-center HD.<sup>7</sup> Findings from around the world indicate that in Canada, the United Kingdom, Australia, and the United States, less than 20% of patients remain on PD 5 years after starting ESKD therapy; the majority transfer to in-center HD.<sup>40</sup> Evaluating the degree of utilization of home therapies must take into account all of these figures, not simply what happens to patients when they start ESKD therapy.

In addition, when attempting to calculate the number (or percentage) of patients on PD at a specific point in time, it is often difficult to know whether a given patient is or is not to be counted. There is marked variability in the definition of who is to be considered as an incident PD patient. Some studies include patients from the time the PD catheter was inserted, others from the time that they performed their first PD treatment, and others include patients only if they have already been on PD for periods of 6 weeks to 90 days.<sup>41</sup> Similarly, there is substantial variability in the definition of who should no longer be considered as a prevalent PD patient; that is, when has a patient experienced “technique failure?” In some studies, patients who transition from PD to HD are considered to be off PD from the moment of transfer; some require a minimum of 1 month of HD before excluding the patient, whereas others require “permanent” transfer.

In [Table 1](#), a summary of these various barriers and potential ways in which to address them, is presented.

### Global Implications

The challenges of growing PD in the United States, discussed above, have implications for PD growth worldwide in both higher-resource and lower-resource countries. In higher-resource countries, there is wide variation in global utilization of PD. For example, about 30% of patients on ESKD are maintained on PD in Colombia and regions of Mexico but only 3% in Japan.<sup>7</sup> Comparing PD utilization in different high-income countries and understanding the meaning and significance of these differences can be challenging. These variations in practice patterns need to be understood in the overall context of how ESKD care is provided: Who owns the facilities? Are they for-profit or non-profit? Are there financial incentives or disincentives for home therapies or in-center dialysis? What is the relative cost of PD versus in-center HD, including medications, hospitalizations, and the cost of dialysis itself? What are incidence and prevalent rates of ESKD in a particular region? Are all patients on ESKD,

**Table 1.** Barriers to the broader utilization of peritoneal dialysis and potential solutions

Barriers to the utilization of PD	Potential solutions
Inadequate patient education regarding options for KRT	Provide comprehensive education to CKD patients about KRT options, emphasizing the advantages of home-based options Promote research to better understand what factors influence patients' decisions about modality choice
Paucity of well-trained clinical personnel	Encourage the routine utilization of transitional care units Improve the education of nephrology trainees in PD Focus on attracting excellent nursing staff as well as technicians, dieticians, and social workers
Large number of elderly/ frail patients for whom self-care is difficult	Implement assisted PD Increase use of incremental PD
Fear of machines or unwillingness to be tethered into place	Increase use of CAPD
Use of HD as the default for urgent dialysis	Build capacity for Urgent Start PD
Abundance of small PD programs with poor outcomes	Consolidate PD programs into centers of excellence
Variability in definitions of incident and prevalent patients	Standardize the way we report numbers of patients on PD

CAPD, continuous ambulatory peritoneal dialysis; HD, hemodialysis; KRT, kidney replacement therapy; PD, peritoneal dialysis.

independent of age and comorbidities, being offered dialysis? Are there restrictions on which patients are offered ESKD care? How is conservative (nondialytic care) organized and provided? Are there many in-center dialysis units in a particular region and what is the accessibility of these facilities?

Except for Hong Kong, which has a PD first policy, patients in high-income countries are generally given a choice of dialytic modality for ESKD care and the patient makes the final decision about therapy. With this patient-centered approach, it is important to provide patients and their families with the information to make an appropriate decision. This involves developing well-structured educational programs that provide balanced, equitable educational resources for patients that are integrated into routine CKD care to permit patients to make informed decisions. In addition, providing adequate education to nephrologists, nurses, nephrology trainees, social workers, and dieticians is essential. Barriers to PD, which may vary in different regions, need to be carefully researched, and educational programs for staff designed to address and discuss these barriers. The advantages of PD need to be emphasized: flexibility, home-based therapy, more continuous (daily or near daily) treatments, elimination of postdialysis fatigue, slow ultrafiltration rates, etc.

Assisted PD programs should be developed or expanded to support patients and enable them to comfortably organize care in their home. It is important

to develop standardized means of tracking outcomes in individual facilities in terms of mortality, technique failure, peritonitis rates, exit site infection rates, etc.; and develop strategies to make sure individual facilities follow practice patterns that conform to international standards of care via robust national or institutional monitoring and tracking programs. Educational programs need to be made available to individual facilities to ensure that acceptable standards of care are being practiced. Studies have clearly shown that in higher-resource countries, international standards are not always followed with resultant poorer outcomes and that emphasizing these international standards of care can result in improved outcomes.<sup>42</sup>

In lower-resource countries, PD has been suggested as an effective means to expand ESKD care for a variety of reasons, including potentially lower costs, reduced travel for patients who live in rural areas at a distance from an HD facility, reduced need for trained personnel to deliver care, technical simplicity, etc.<sup>43,44</sup> Successful programs have been established in several low-resource countries; however, organizing these programs has required that key issues be addressed, as discussed in detail by Paudel *et al.*<sup>45</sup> These issues include ensuring a reliable source of supplies at a reasonable cost, obtaining government support, having well-trained personnel, and maintaining high quality standards of care with appropriate monitoring of outcomes. Adequate patient support and detailed education of staff and patients need to be provided. In fact, all the factors outlined in Table 1 apply to program development in lower-resource countries. However, understanding the special or unique obstacles that are present in a particular region is essential. Of special importance, however, is the issue of relative cost of PD versus in-center HD. Studies have suggested that the cost of PD is less expensive if the costs of PD solutions are controlled and economically responsible assessments are made of HD costs to include not just the cost of an individual treatment; but, the amortized costs of other factors such facility construction, water and water treatment, electricity, and machinery.

## Conclusion

As reviewed herein, there are many factors operating to limit the more widespread implementation of PD. Concerted, multifaceted efforts will be required to overcome these barriers. Several recommendations targeted at addressing these issues are presented in Table 1. If these issues are in fact addressed and appropriate changes implemented, it remains to be seen what percent of incident and prevalent patients on ESKD will be treated with PD.

## DISCLOSURE

IT serves on the scientific advisory boards of Triomed and liberDi and has received stock options from the latter. FOF has nothing to disclose.

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